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ABSTRACT

This guide was developed to present activities which inform the teacher and students of solid waste management problems that are becoming commonplace in villages. The lessons included present alternatives for taking care of the environment and contains methods to make not only school children more sensitive to environmental problems, but hopefully to inspire a grassroots program that will address local concerns. The first chapter incorporates and discusses the values and other aspects of the curriculum. The content areas presented can easily be integrated into many other areas of study including science, social studies, math, art and writing. Units presented include: Our Places and Traditions, Our Ecosystem--Earth, Waste, Reduce, Reuse, Recycle, Disposal, and Back to the Future. Contains a glossary and a list of 22 resources in Alaska and 12 references outside Alaska. (JRH)

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Changing Waste in Changing Times

Solid Waste and Natural Resource Issues in Rural Alaska — A Teacher's Guide

Shirley Moses

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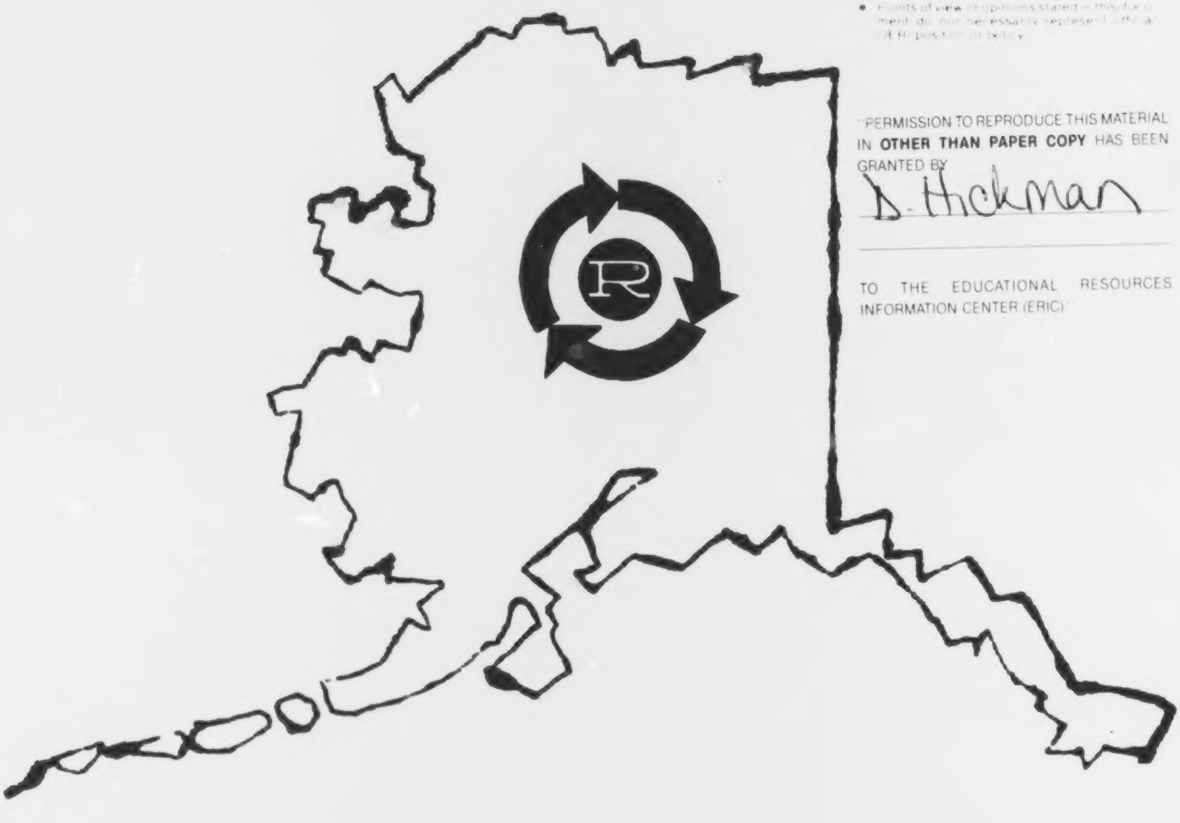

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TABLE OF CONTENTS

INTRODUCTION 1
- Acknowledgements 1
- General Information 2
- How to Use This Curriculum 2

UNIT ONE: OUR PLACES AND TRADITIONS 5
- I. Historical Perspective: Interviewing Elders 5
- II. Why Are We Here? 6
- III. Where Does Local Food Come From? 8
- IV. Dependency on the Land: Habitat and Mono-cultures 10
- V. Our Village: What Did It Look Like Then? 13

UNIT TWO: OUR ECOSYSTEM - EARTH 15
- I. Natural Resources 15
- II. Food Chains and Food Webs 18

UNIT THREE: WASTE 23
- I. Sources of Waste 23
  - A. Lifestyles 23
  - B. The Origin of Products: Raw Materials 25
  - C. Processing and Manufacturing 28
- II. Types of Waste 31
  - A. Solid Waste: Be a Garbage Detective 31
  - B. Pollution 33
  - C. Hazardous Waste 35

UNIT FOUR: REDUCE 41
- I. Source Reduction - Tracking Your Trash 41
- II. Better Buying - Understanding Packaging 45
- III. Advertising - Why Do We Buy? 50

UNIT FIVE: REUSE 55
- I. Waste Not, Want Not 55
- II. Some Innovative Ideas 57
- III. Reusing to Grow: Composting and Gardening 59

UNIT SIX: RECYCLE 63
- I. What is Recycling? 63
- II. Problems With Recycling 65

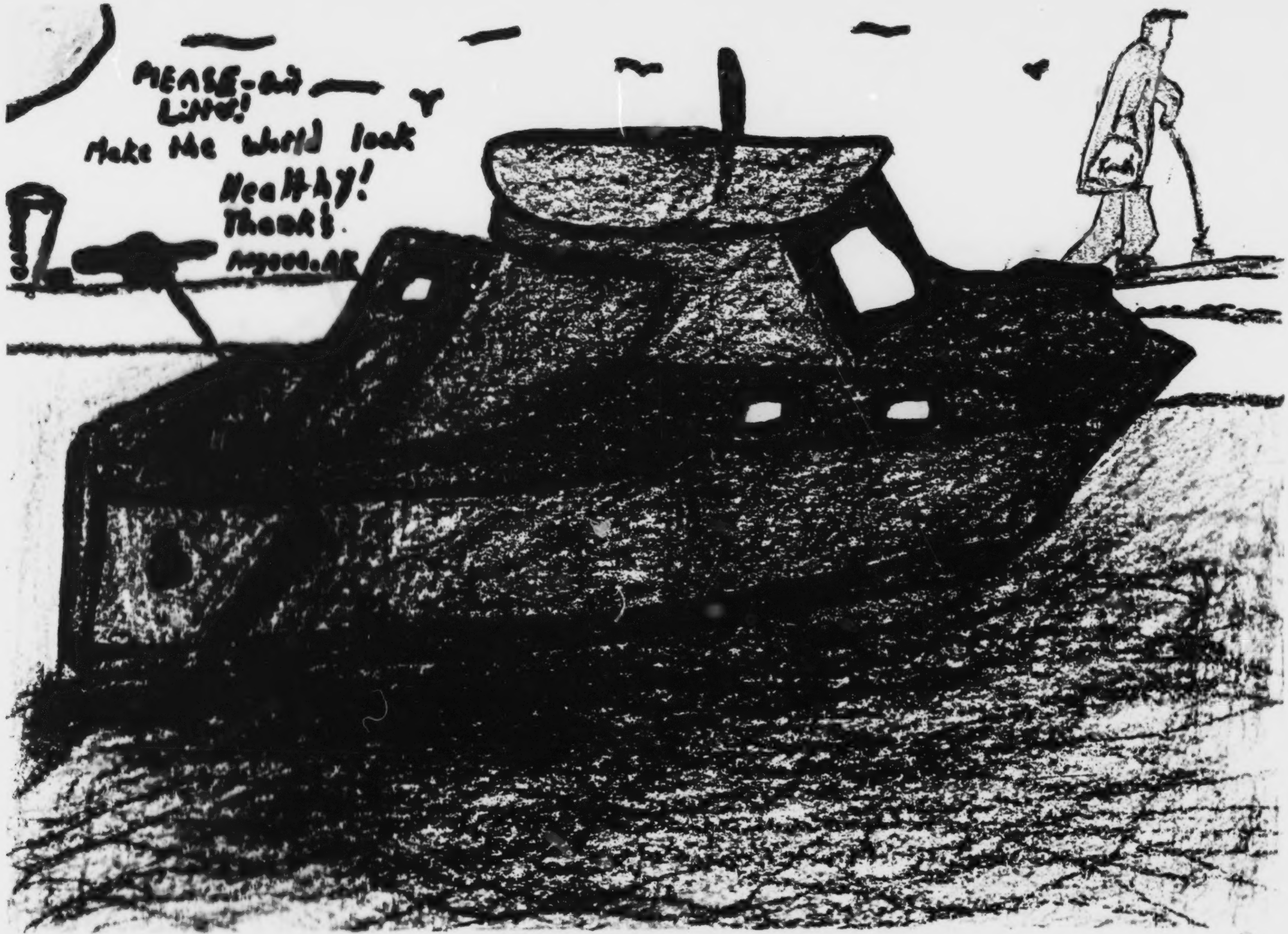
UNIT SEVEN: DISPOSAL 69
- I. Biodegradable Waste: Natural Decomposition Cycles 69
- II. Digging In: Looking at How Our Community Disposes of Solid Waste 72
- III. The Garbage Industry: A Billion Dollar Business 74
- IV. Waste Incineration: Pros and Cons 76
- V. Costs of Disposal 78

UNIT EIGHT: BACK TO THE FUTURE 81
- I. Think Globally, Act Locally 81
  - A. Connections 81
  - B. What Can I Do? 83

Endnotes 87

Glossary 89

Resources 93
- In Alaska: 93
- Outside Alaska: 96


PLEASE-Out Litter!
Make the world look Healthy!
Thanks.
Angoon.AK

-HARVEY PITKA, 7TH GRADE, ANGOON AK

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David Dederer, working for the Northwest Renewable Resources Center, edited the curriculum. Gregg Collins of the Northwest Renewable Resources Center did the typesetting and layout. Lisa Gilbert, Health Educator with the Alaska Health Project, did preliminary editing. Margaret Drumm, Environmental Engineer, and Kris Benson, Environmental Health Specialist, both with the Alaska Health Project, conducted technical review. Carl Reller, Environmental Chemist and Educator with the Alaska Health Project, provided material for the chapter on hazardous waste.

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The art at the beginning of each section was created by students in the communities of Angoon and Allakaket, Alaska. The students participated in an art contest upon completion of the first field test of this curriculum.

Final thanks go to the members of the project's Advisory Committee (listed elsewhere in this document) for their encouragement and editing assistance.

INTRODUCTION

I. General Information

Rural communities depend on the earth's resources for subsistence. Our Alaskan Native lifestyle has always emphasized the importance of taking care of our environment, because we live so close to the land. It is to our advantage to maintain healthy, diverse and undamaged land and ecosystems. Most Native Alaskan communities have customary rules for treating the land and the ecosystem. These rules have been passed on through the generations: "Do not waste," "Take only what is needed," "Treat the animals with respect," among others. We believe that if these and other rules are followed then the land will continue to provide. Subsistence peoples are the original conservationists (although we may not use that word), because our lives depend on maintaining natural resources.

"Changing Waste in Changing Times" was developed to present activities which inform the teacher and students of solid waste management problems that are becoming commonplace in our villages. Alaskan residents produce almost twice as much garbage as the national average. The average daily rate of garbage generation in America is 3.6 pounds/person. In Alaska, that rate is about 6.5 pounds/person. The ultimate solution for village residents is to reduce the amount of waste produced. Meanwhile, careful management of waste is needed to prevent pollution.

The importance of this curriculum extends beyond the classroom; the lessons present alternatives for taking care of the environment. The curriculum contains ways to make not only school children more sensitive to environmental problems, but hopefully to inspire a grassroots program that will address local concerns. Through community cooperation, we can work together to reduce the amount of solid waste that litters our villages.

II. How to Use This Curriculum

Each unit is intended to stand alone. You may choose to teach only one unit or a combination of units. We believe that if all of the chapters are presented, the first two, "Our Ecosystem - Earth" and "Our Places and Traditions," could be used as an overview and introduction and then again at the end to recap and evaluate what was learned. The first chapter is important because it incorporates and discusses the values and other aspects of the curriculum.

The content areas presented in this curriculum can easily be integrated into many other areas of study: science, social studies, math, art and writing, to name a few. Many of the units have a dozen or more student activities from which to choose. The teacher can select those that are most appropriate for a particular subject area.

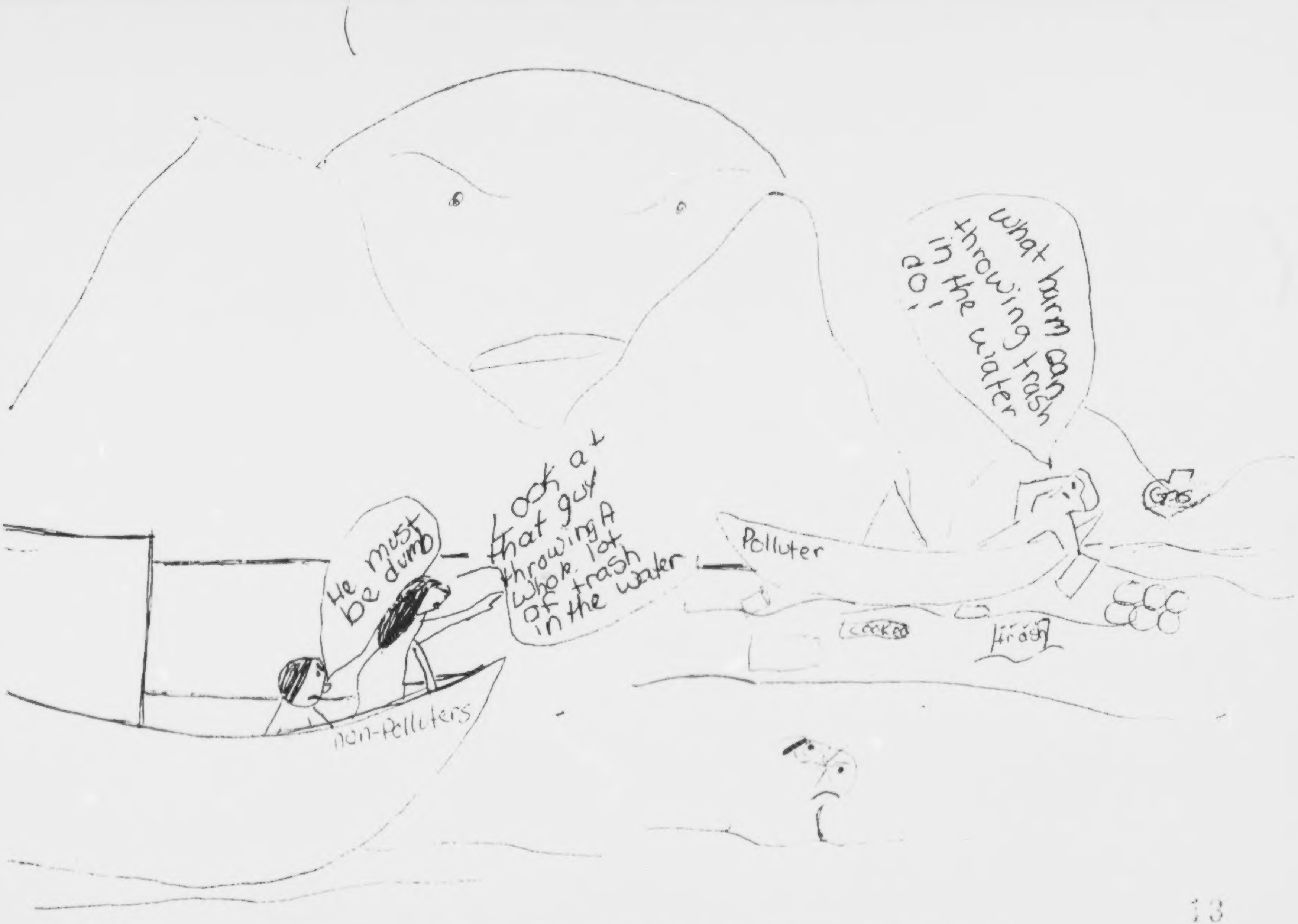
We suggest that you work closely with the community. Village residents can be a resource for information for tailoring this curriculum to be relevant and locally-based. Althcugh written specifically for small and rural Native villages, the curriculum will still need to be adapted for the specific geography and culture of the school's region.

Some preparation should be done well in advance. For example, contact people who might come to speak to the class (such as representatives of Alaska Department of Fish & Game, Alaska Department of Environmental Conservation, your regional health corporation or other state, tribal or federal organizations) to find out when they will be in the village. Also, work with Elders of the village early on to incorporate their local knowledge.

This curriculum emphasizes discussion over written handouts as a way of learning. This guide is written for the teacher, with activities for the students labeled accordingly. Words that appear in capital, bold letters are defined in the glossary at the end of this curriculum. A resource list provides contacts that will help you find supplemental materials and expertise.

There are many environmental issues that Alaskans are confronting now and will continue to address in the future. By discussing the importance of these issues with students, we hope to provide them with the knowledge and inspiration to work toward the protection of this, our Native land.

Shirley Moses


What harm can throwing trash in the water do!
Look at that guy throwing A whole lot of trash in the water
He must be dumb
Polluter
non-Polluters
Gas
trash

-CHRISTINA JOSEPH, 7TH GRADE, ANGOON AK

UNIT ONE: OUR PLACES AND TRADITIONS

I. Historical Perspective: Interviewing Elders

Objectives:

Students will:

1. Establish relationships with and gain appreciation for Elders.
2. Develop ideas on how to protect their environment from more damage.
3. Gain understanding of local customs and traditional ways.

Teacher Background:

Traditionally, Native people have looked to their Elders for advice. The village has always relied on their knowledge of the land and its resources. Elders respect the traditional ways of conservation. They are a valuable resource themselves. Elders have a perspective on life that is closely tied to the land. With all of the rapid changes occurring in the villages, this relationship between the people and the land may be lost.

Much meaning is lost when information is communicated using new methods -- the shortcomings of radio, audio tape and TV are obvious, and even the printed word often can't tell the whole story. Some values are unspoken and are difficult to translate. Our Elders have valuable wisdom to impart about how to use our resources, and we must take the time to talk with them face to face to fully understand their knowledge.

The importance of the local traditions and respect for Elders' traditional values cannot be overemphasized. Establishing strong relationships with village Elders at the start of your work with this curriculum will greatly enrich your lessons and the students' experiences. As you work through the curriculum, you will see that there are many opportunities for Elders to be involved -- they can provide invaluable cultural and historical perspective on natural resources.

Student Activities:

1. Establish a relationship between the class and one or more willing Elders. Ask the children to invite Elders to your classroom. Have the students explain to the Elder(s) the nature and purpose of your work on natural resources and solid waste. Try to document an Elder's perspective on values toward the environment. Use audiotape or videotape to record Elders.

2. Ask an Elder what should be done about waste and how to protect natural resources.

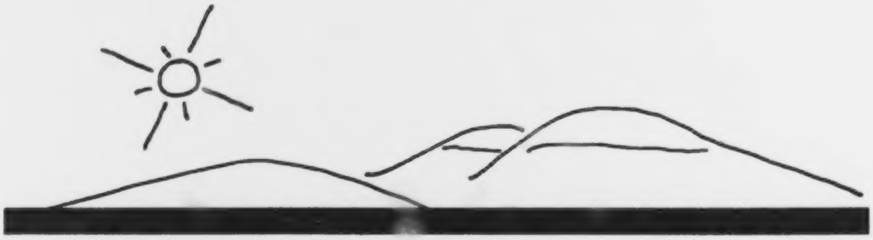
Discussion Ideas:

1. Why is it important that we listen to and understand our Elders?

2. What can our Elders offer that no other people, no book, no TV show and no movie can offer?

3. Is there an effective way to record and remember our Elders' wisdom? What are the limitations of audio tape, video tape and taking notes? How can we pass our Elders' knowledge down to our children and grandchildren?

II. Why Are We Here?



Objectives:

Students will:

1. Learn about the connection between where villages are set up and the natural resources nearby.
2. Interact with Elders to gain historical appreciation of their culture.
3. Investigate how their village came to be where it is.

Teacher Background:

Villages and towns started in many ways. Historically, traditional Native people subsisted off the land, moving with the seasons. Hunting, fishing and gathering food were done according to the season and the availability of food sources. The influx of non-Natives changed this way of life. Non-Natives brought with them a culture based on commerce and agriculture, both of which demand non-nomadic lifestyles: the farmer must stay near his fields, the shopkeeper near his shop, the manufacturer near his factory, and so on.

The ways of non-Natives have had a great impact on how and where Natives live. Natives are no longer self-sufficient nomads; they rely on commerce with the "outside" world. For years, Natives have traded resources (furs, fish, timber, oil and mineral rights, etc.) for goods not otherwise available (snow machines, chain saws, outboard motors, etc). Permanent settlements have evolved as part of this changing way of life. The locations of villages reflect this changing way of life -- most settlements are either at a convenient trading point or close to an abundant resource that can be traded.

Student Activities:

1. Elders are a great resource on why and how your village came to be where it is. But before interviewing Elders, students need to make thoughtful preparations. Things to think about and discuss whenever you want to involve Elders include:

   - Should we invite the Elders to visit us or should students go to them?
   - What's the best way to record our/my conversation with an Elder?
   - How can we practice and be well prepared to make the most of a conversation with an Elder?
   - How can we show our respect and appreciation for our Elders taking time to talk with us?

   Help the students come up with a checklist like the one below for interviewing Elders.

   Preparation checklist for interview:
   a. Find out when the Elder will be available.
   b. Make an appointment to interview him/her.
   c. Be neat and courteous.
   d. Be on time.
   e. Be prepared, know your questions.
   f. Be thankful for his/her time.
   g. Be sure to check out your tape recorder before you go.

   Questions students might want to ask Elders about the location of your Village include:

   - Where did you live, hunt, fish, etc. when you were growing up?
   - Where did your parents live when they were growing up?
   - Why did the village develop in this location?

2. Get a map of your area. Ask the Elders to show where they hunted or fished. Put the traditional Native names on the map. For example, the Native name for Tanana is Nukluklayet and the name for Mt. McKinley is Denali.

3. Have the students draw pictures/maps/diagrams of your village, showing all the features that make the place special. Then have them depict an ideal or perfect village.

Discussion Ideas:

1. Why is our community located here? Who decided it should be here? Is this a place where Native peoples traditionally lived? Why or why not?

2. Are the things that originally drew people to this site still here? What will happen to our village if the things that attracted people to live here are gone?

3. What would an "ideal" village site look like? What features would it have? Which of those features does your village have? Which does it lack? Are there ways your village could be more "ideal" simply by making better use of the present site?

Resources:

1. Dictionary of Alaska Place Names. Orth, Donald J. Geological Survey Professional Paper 567. U.S. Govt. Printing.

III. Where Does Local Food Come From?

Objectives:

Students will:

1. Learn about the sources, location and availability of local food.
2. Develop mapping skills.

Teacher Background:

Local food sources vary from one region to the next. Local food may come to us from forests, flats, tundra, the sea, marshes, rivers and lakes. Each village has different resources and, therefore, different food sources.

Student Activities:

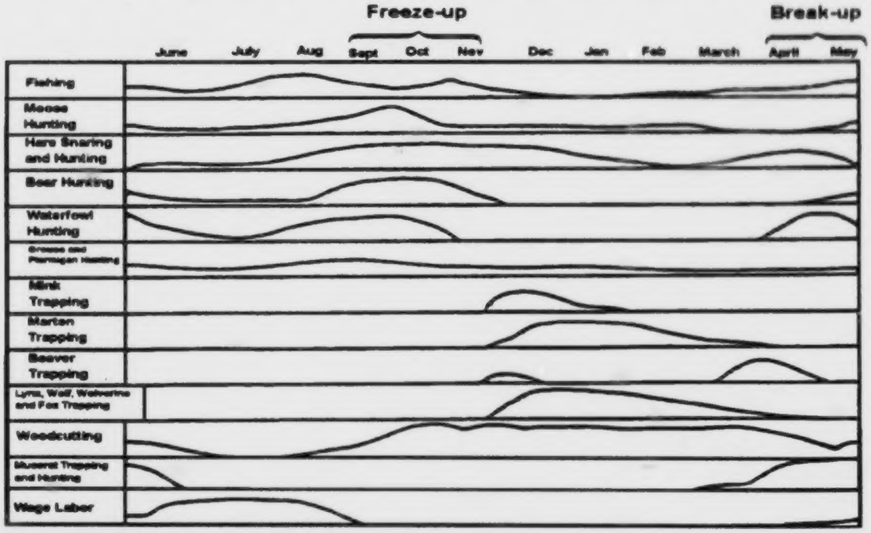
1. Make a list of foods commonly found in your area. Construct a chart. The chart will be different depending on where you live. An example for one region of the interior follows on the next page:

Type of Food	Availability	Methods of Getting Food	Location of Food
Caribou	Hunting season	Hunting (Adults)	Migrating herds
Blueberries	Late summer	Gathering (Adults & children)	Scattered growth
Salmon	June, July & August	Fishing (Adults)	Rivers & sea

2. Make a list of foods a Native person can obtain today in your village. This time, include foods you can buy at the store. Think of:
    - a. Availability
    - b. Method of obtaining food
    - c. Location
    - d. Cost
    - e. Nutritional Value

3. a. Make a map (or use a USGS map) of the area around your community and label the map "Food Producing Areas."
    - b. Color those areas that produce (or are capable of producing) food.
    - c. Make a scale plastic overlay marked off in a grid. Place it over your map and count the square units (measure in miles) that can support life to supply food. What percentage of the total area supports food sources?

4. Make a seasonal hunting chart like the one below for your area.



Annual Activity Cycle, Chalkyitsik, Alaska

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Discussion Ideas:

1. What was life like in the village when all food was collected by fishing, hunting or gathering?

2. What percentage of your food is obtained from hunting, fishing and gathering? What percentage is store-bought?

3. Discuss the benefits and costs of obtaining food locally. What processes are eliminated when you gather food locally? (freight, packaging, advertising, etc.) What do you gain when you gather food locally? (self-sufficiency) What expenses do you incur? (equipment expense/repair, nets, motors, guns, etc.)

IV. Dependency on the Land: Habitat and Mono-cultures

Objectives:

Students will:

1. Learn how we and other creatures depend on the land for our survival.
2. Learn about the importance of maintaining fish, wildlife and human habitat.
3. Learn about mono-cultures.
4. Draw a game cycle.
5. Demonstrate mapping skills.

Teacher Background:

Traditional Native peoples depended entirely on the land for their survival. Every bit of food they ate, every article of clothing they wore and every tool they had came from the land and its animals and plants. Today, although we may buy supplies from distant stores and we purchase products made with materials from all over the world, we are still dependent on the land. For many of us the land provides the resources (fish, furs, oil, etc.) that we sell for the money to buy goods and pay for services. And many Native peoples still depend on the land for a large portion of their food supply.

If we understand how much we depend on the land, it's easier to see how other living organisms also depend on healthy lands. Just like us, every plant and animal depends on certain kinds of land, certain habitats. We must work to ensure the health of all habitats if we want to ensure our own survival.

Some peoples and creatures are heavily dependent on specific habitats and food sources. A mono-culture depends on one crop or one animal to supply its food. Mono-cultures have their disadvantages; depending on one food source is like "putting all your eggs in one basket." Some animals fit a very narrow niche in the environment. If people are similarly restricted (by choice or pressure), the chances of one major disaster wiping them out are increased. Broadening dependencies means a better chance of survival.

Historically, Native peoples followed game cycles. They traveled the countryside, rivers and sea in pursuit of fish, game and edible plants. Their hunting, fishing and gathering were limited only by their ability and willingness to move. No outside agency told them when and where they could shoot a caribou or catch a salmon. Things are different today. Natives must limit their fishing and hunting according to state and federal regulations.

Some animals have been pushed out of their natural habitat (e.g., wolves) because of people thinking, "Oh, they'll go someplace else." What's wrong with that kind of thinking? For some animals, there is no place else because they a fit a narrow niche. There are several groups fighting for the habitat of a species of animal in Alaska. The Gwich'in Indians-Yukon Flats are fighting development of the Arctic National Wildlife Refuge on the North Slope. They maintain that caribou migration/breeding grounds would be damaged.

Student Activities:

1. Get a USGS map for your area. Have the students make a map of local migration routes of animals.

2. Research animals that are currently on the endangered species list. Why do animals become endangered or threatened? Are there any animals in your area that are threatened or endangered? (The Alaska Department of Fish and Game and the U.S. Fish and Wildlife Service should have information on endangered species.)

3. Talk to Elders about traditional food gathering. Ask how they relied on the different seasons to provide their food. To what extent did they rely on the store to supplement their food? Did they have to roam far to find food sources, or did they generally stay in one place?

4. Research the Exxon oil spill. What environmental damage was done? How were salmon and other marine life affected? Did the oil spill affect fishing? Native subsistence patterns?

   What precautions/safety measures did the oil companies have in place prior to the spill? How about now? How has Exxon compensated fishermen and others whose livelihoods were affected by the spill?

5. If you live in a village on the coast or on a river, find out if there is a spill response (contingency) plan in case of an oil spill from fuel tanks in the village.

6. Contact the Gwich'in Steering Committee (see resources) as a class project to research habitat issues further.

Discussion Ideas:

1. Make a list of animals, including man, that live on the land and in the waters near your village. All animals need a certain kind of habitat to survive -- discuss the features each one of the animals on your list needs in its habitat. For example, salmon need appropriate water levels, the proper kind of gravel and protection from predators to spawn successfully. Brown bear need lots of space to themselves and huge supplies of berries, grubs and other food sources.

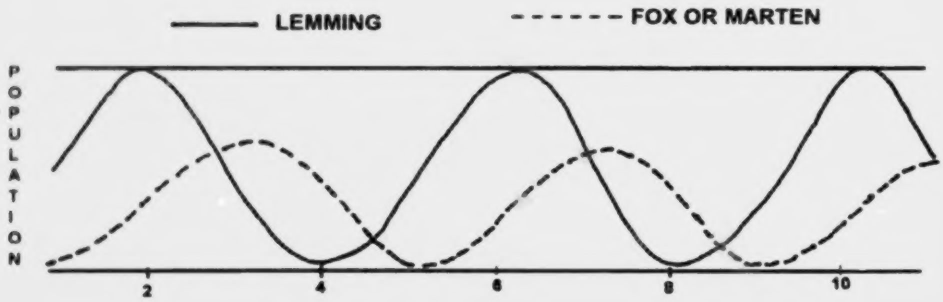
2. How were traditional Native peoples locked into seasonal and animal migration cycles? Did being locked into these cycles give these peoples freedom or did it limit them?

3. If you buy all your food from a store are you part of a monoculture? What would happen if the store ran out of food?

4. Imagine that you lived in Alaska a thousand years ago. You followed animal migration patterns for your food. This year the caribou (or the deer or the fish) didn't come. What happens then? What are the chances of your group surviving? What happens to the sick, the weak, the very old or very young people?

   Could this happen today? Do we depend on one crop or animal as our main food or income source?

5. Discuss what happens to the fox or marten population every four years. How do animal cycles affect human behaviour? (Hint: in coastal villages, do you see a lot of new boats and trucks the year after a good fishing season?)



6. Discuss regional or local dependencies on fish or animals. What species do people in your area depend on for food and/or income?

7. Imagine that you live and fish in a community near which there was a major oil spill several years ago, and the fish population has declined (you may not have to use your imagination if you live on Prince William Sound). What will you do to supplement your food source this next winter? Does the poor fishing season impact others in your community who don't fish? If so, how?

8. Can you think of animals statewide that are being affected by development or encroachment on their habitat?

Resources:

1. Gwich'in Steering Committee: P.O. Box 202768, Anchorage, AK, 99520. Their phone number is 258-6814.
2. Make Prayers to the Raven, a video series on traditional and subsistence lifestyle of Koyukon people, based on a book by Richard K. Nelson.

V. Our Village: What Did It Look Like Then?

Objectives:

Students will:

1. Learn about effects humans have had on the local landscape.
2. Investigate how their village has changed since the Elders were children.
3. Gain a sense of community.

Teacher Background:

It is important for children to explore their own environment and learn their local history. Very little local history is written about villages. However, oral tradition has been passed on from one generation to the next. One valuable source of local history available in the village is the Elders. Many local people are willing to work with teachers, and gladly talk to students about their experiences and knowledge about their culture.

Student Activities:

1. Take students to a high point near the school with a good overview of the townscape. Ask the students to imagine what the land in front of them looked like 150 years ago. Leading hints will help: Was there a town here? If so, was it a winter camp, summer camp or permanent village? Were there permanent houses? Were there simple houses? Were there more trees (where appropriate)? Were there cars and snow machines?

   The teacher can then lead the imagining through time towards the present, allowing the students to generate ideas on what happened as the area was settled and developed.

2. Invite an Elder to describe what the area looked like when he/she was a child.

3. Have the students conduct a series of interviews with their parents, older students and others about what the village was like when they were children. Compare perceptions across generational lines (e.g., teenagers, adults, Elders).

4. Search for old photographs of the village and compare them with what the village looks like now. If possible, have students take photographs from the same viewpoints as the historical photos; the class can then compare "before and after" photos of the same location.

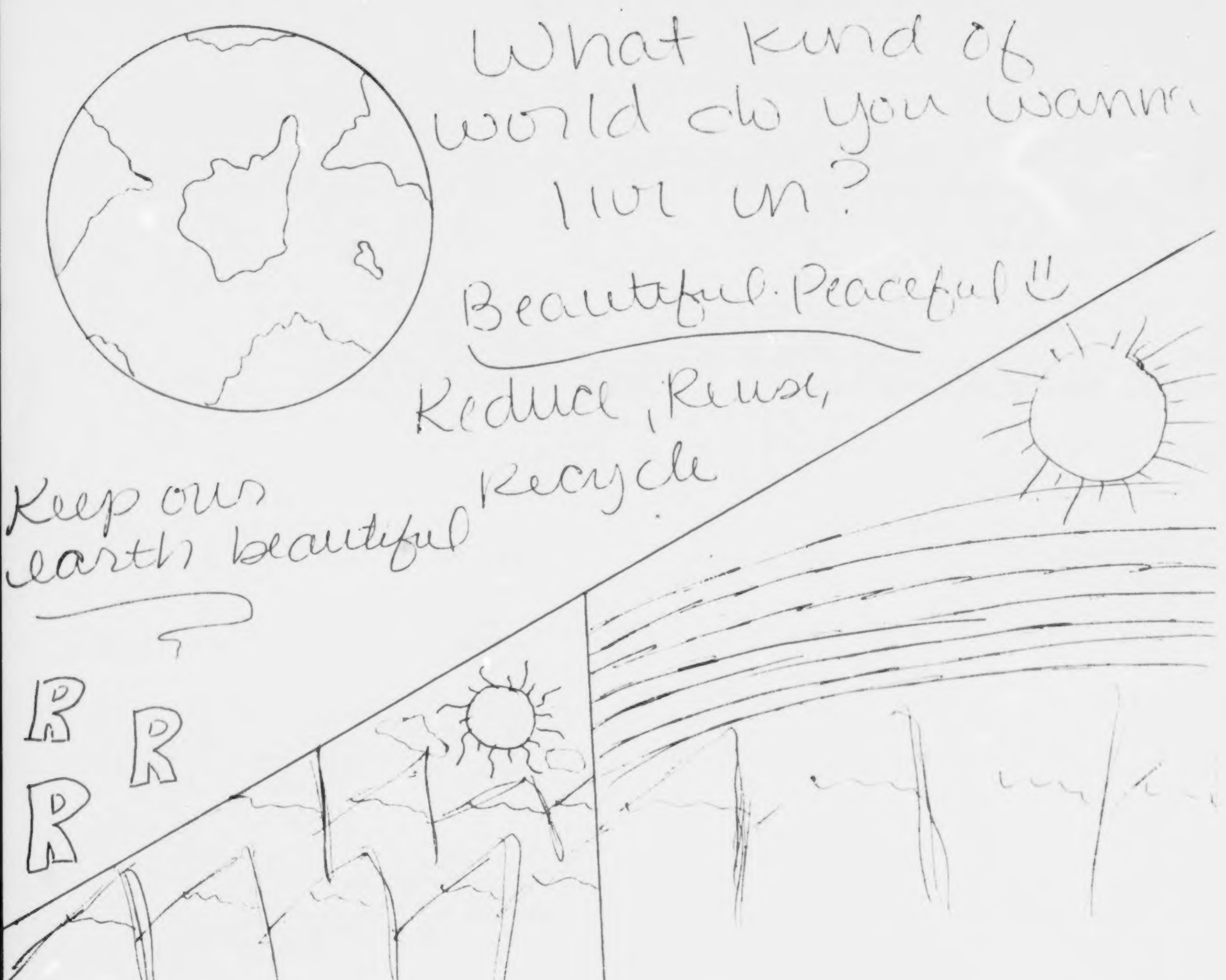
5. Using information from Elders and parents, draw maps of the village at various times in the past. Draw a map of the village in the year 2010.

Discussion Ideas

1. What function(s) does our village serve? (Why do we live in a village rather than alone or just with our families?)

2. How does the village serve its functions? Why does our village look the way it does?

3. What forces have shaped our village and what determines how our village will look ten, twenty or fifty years from now?


What kind of world do you wanna live in?
Beautiful. Peaceful !!
Reduce, Reuse, Recycle
Keep our earth beautiful
R
R
R

-MELANIE SAMATO, 8TH GRADE, ANGOON AK

UNIT TWO: OUR ECOSYSTEM - EARTH

I. Natural Resources

Objectives:

Students will:

1. Learn key terms used to describe and discuss ecosytems: natural resources, renewable and nonrenewable resources, species, threatened species, endangered species, ecosystem and extinction.
2. Discover how humans are altering natural resources.
3. Determine what obligation we have to protect the environment.

Teacher Background:

No one knows the number of plant and animal **SPECIES** on earth. Scientists have given names to about one and a half million varieties of life, and they estimate the total number, including the unnamed species, is close to four million. Every one of these millions of species of plants and animals -- and each distinct organism within it -- is a unit of the web of life.

Every species on Earth lives in a specific environment, or **ECOSYSTEM**, with its own climate, altitude, soil and water characteristics. The ecosystem can be as small as a decaying log or as large as Alaska's North Slope. Ecosystems are often richly diverse -- delicately balanced self-sustaining communities of many interdependent species.

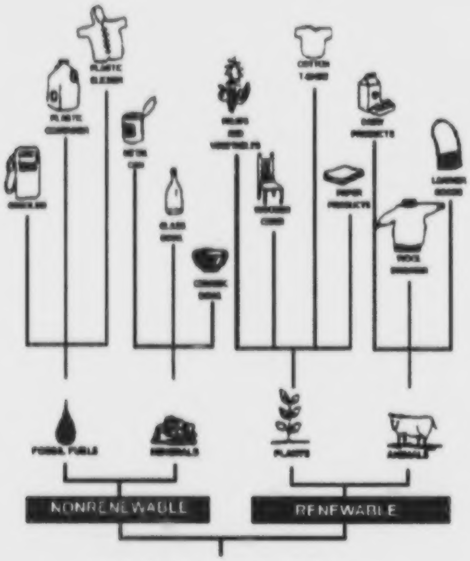
Today, the diversity of species is disappearing because of **NATURAL RESOURCE** damage, which can lead to **EXTINCTION**. Our one human species is multiplying so fast and altering the Earth's environment so severely that we have caused the extinction of thousands of other species that once shared life on Earth with us.

Whole species have been destroyed because of careless use of natural resources by humans. Sometimes the destruction is direct -- hunters killing all the animals, as when buffalo were slaughtered in North America, leaving only a few. Indirectly, land development often destroys habitat, resulting in diminished populations of local species. Uncontrolled pesticide application kills not only the varieties of insects they are meant to reach, but also can kill birds who eat the insects.

Some species become **THREATENED** when their habitat is reduced, damaged or destroyed. The population may still be abundant. However, if a species' numbers have been reduced to the degree that the threat of extinction exists, it is considered an **ENDANGERED SPECIES**. Species can be threatened or endangered due to five types of conditions: 1) destruction of habitat, 2) introduction of foreign species into an existing ecosystem, 3) commercial hunting, 4) human control of predators, and 5) pollution.

As of 1991, there were over 600 species of plants and animals native to the United States and more than 500 species living in other parts of the world listed as endangered or threatened[1]. By the year 2000, one million species, including plants, insects, worms and mites, may become extinct.

In addition to particular species, other resources are threatened. There are two types of natural resources: **RENEWABLE RESOURCES** (naturally occurring raw materials derived from an endless or cyclical source such as the sun, wind, falling water -- hydroelectricity, fish and trees) and **NONRENEWABLE RESOURCES** (naturally occurring raw materials which, because of their scarcity, the great length of time required for their formation, or their rapid depletion, are considered exhaustible; in other words, when they are gone, they are gone -- an example is petroleum.) With careful management, the consumption of renewable resources can be approximately equal to replacement by natural or human-assisted systems.



EARTH'S RESOURCES

We have an obligation to protect our environment and to live in harmony with the land. If we take care of the land, it will take care of us.

In our constant rush towards development and progress, we must consider the effects on our own ecosystem. We have damaged the habitat of bear and moose, salmon and whales —

in doing so, we also damage our own habitat. When we ruin the diversity of ecosystems through unwise resource use, we lessen the complexity and beauty of our lives. And as we increasingly damage the earth, we must consider the health of our own particular environment, the human ecosystem. How much damage will it take until **we** are the endangered species?

Student Activities:

1. Students list or draw pictures of the renewable and nonrenewable resources they have used or consumed in the past 24 hours. Classify each as: a) essential for survival, b) necessary for maintenance of their present lifestyle or c) a luxury.

2. Read "Grandfather's Wisdom" (a lesson on survival and the importance of natural resources in our lives). "Grandfather's Wisdom," a tale in the book According to Grandfather written by Audrey Loftus, tells about a family's struggle to survive after capsizing on the Yukon River and losing all of their belongings except for two knives and a hatchet. Their grandfather's survival skills and ties to the land enable them to survive. Discuss the different resources used by their grandfather. List the various products (ecosystems) that were utilized. Make a poster or book depicting the story as it happened. You could incorporate the message of preserving our land by taking care of the land to ensure that our descendants will be able to survive on the land like our ancestors did. Talk to Elders about local traditional ties to the land.

3. Resource Paths
   Materials: Enough clay or homemade playdough for each student to create several small objects; three small boxes labeled BURY, BURN, and DUMP/LITTER.

   Give each student a portion of clay (or playdough) from a container labeled "earth," and instruct them to use the clay to make models of things they like to use. Ask students to place their finished products in one of the 3 boxes. Ask: After we burn, bury, or throw away something that we like to use, (for example) what will happen to it?

   Repeat several times to show how our use of raw materials (clay, or salt and flour, in this case) uses up the earth's supply of resources. Continue until the clay or playdough is all used up.

   Lead a discussion focusing on what happens after we burn, bury and dump our litter. Discuss what happens when all the materials are gone: Can we get back what has been thrown away? What will happen if we keep taking materials from the earth? What will happen when we run out?

Suggest that instead of throwing the clay or playdough away, reuse it. If we did this with all our garbage very little would be taken to the landfill and we would not have to take as much from the earth. Ask students for some of their ideas for alternatives to "burn, bury, dump/litter." Then ask how much time and energy it would take to reuse or recycle.

4. Research the species currently on the endangered species list.

Discussion Ideas:

1. Give examples of and discuss: ecosystems and species.
2. Do you regularly use products made from non-renewable resources for which there is an alternative made from renewable resources?
3. Are there any luxury items (nonrenewable) you could omit, without a major change in your lifestyle?
4. What are some examples of unwise resource use in your village?
5. What are the consequences of unwise resource use?

Resources:

1. A-Way With Waste: A Waste Management Curriculum for Schools. Third Edition. Washington State Department of Ecology. 4350 150th Avenue NE; Redmond, WA 98052. (206) 867-7043.
2. Turk, T. and Turk, A., Environmental Science, Fourth Edition. 1988. Saunders College Publishing.
3. Loftus, Audrey. Grandfather's Wisdom. Available from St. Mathew's Episcopal Church, 1035 1st Ave., Fairbanks, AK 99701, $5.75 per copy.

II. Food Chains and Food Webs

Objectives:

Students will:

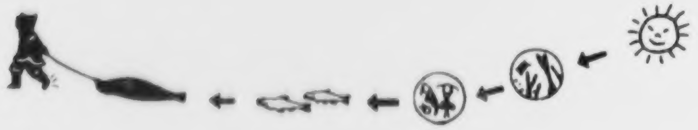
1. Learn about the interrelationships between food sources and become familiar with the following terms: food chain, food web, producers, herbivores, predators, carnivores and trophic levels.

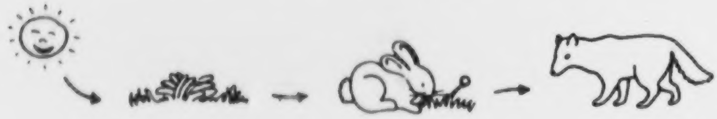
2. Understand the consequences of changes in the food chain.
3. Understand how energy is transferred from the sun to plants to animals.

Teacher Background:

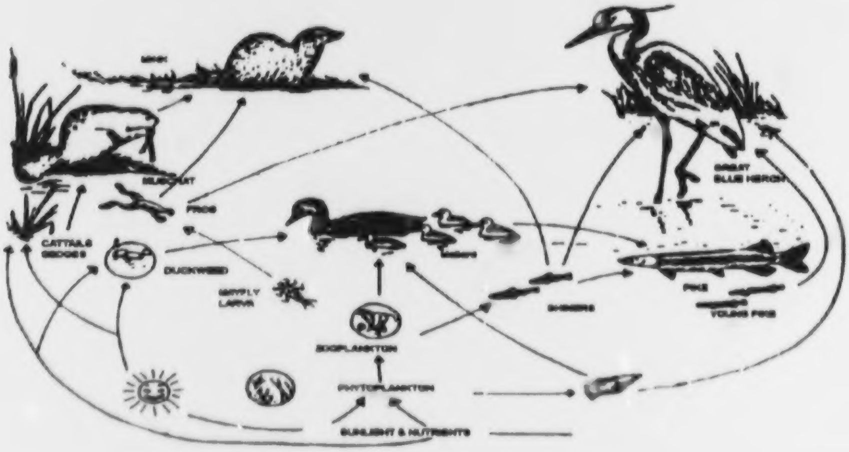
In a **FOOD CHAIN**, there are various organisms categorized by **TROPHIC LEVELS**. An organism's trophic level is determined by what it consumes and what consumes it. Plants, on the first level, are considered **PRODUCERS**. They are the foundation of the food chain. Without plants, no other terrestrial species could exist. The second trophic level, **PRIMARY CONSUMERS**, are grazers, or **HERBIVORES**, animals that eat only plants. At the third trophic level are **PREDATORS**, or **CARNIVORES**, animals that eat only other animals. Animals that eat both plants and animals are known as **OMNIVORES**.

The principle of the food chain is consistent in every ecosystem; however, the types of species change. Here are two sample food chains:





A **FOOD WEB** is the system of interrelationships between all of the organisms in an ecosystem. Here is an example:


MINK
MUSKRAT
FROG
CATTAILS
SEDGES
DUCKWEED
MAYFLY
LARVA
GREAT
BLUE HERON
PIKE
SHINERS
YOUNG PIKE
ZOOPLANKTON
PHYTOPLANKTON
SUNLIGHT & NUTRIENTS

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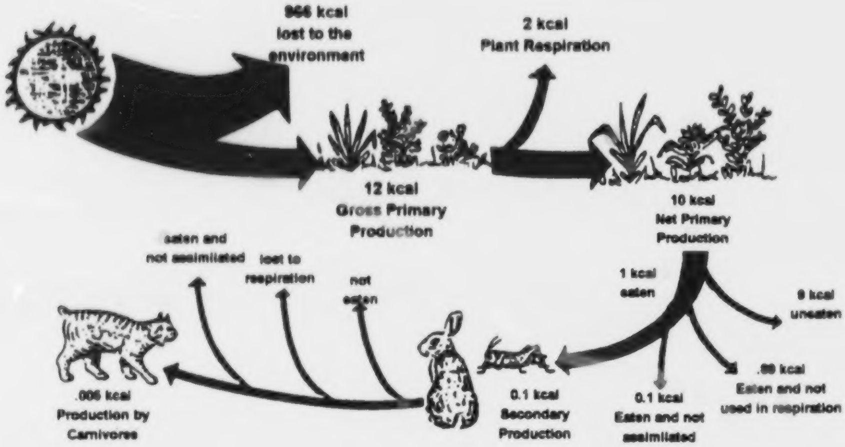
During the production and consumption processes in the food web, energy is passed along from one organism to another. Initially, leaves of green plants convert solar energy to chemical energy. When an herbivore eats the plant, the energy is then passed along to that organism. When a carnivore eats that organism, the energy is transferred to the carnivore. This is illustrated in the diagram below. Note how the initial energy diminishes as it moves through the system:


966 kcal
lost to the
environment
2 kcal
Plant Respiration
12 kcal
Gross Primary
Production
10 kcal
Net Primary
Production
eaten and
not assimilated
lost to
respiration
not
eaten
1 kcal
eaten
9 kcal
uneaten
.89 kcal
Eaten and not
used in respiration
.006 kcal
Production by
Carnivores
0.1 kcal
Secondary
Production
0.1 kcal
Eaten and not
assimilated

Student Activities:

1. Draw a food chain for your area. Include humans.

2. Now draw a food web. Begin with the food web you drew earlier and add to it. Use arrows to show who eats whom.

3. Make a chart like the one below. Fill it in for your area.

PRODUCERS	**CONSUMERS**	
	Herbivores	*Carnivores*
grasses	moose	wolves
plants	insects	bears

Discussion Ideas:

1. What would happen if the producers, the herbivores, or the carnivores in your food web were wiped out?

2. Food and energy are used up as they go up a food chain. Discuss how foods are recycled and energy is used up.

3. What would happen if there were an increase or decrease in the amount of energy you can get from the sun? (examples: volcanic emissions blocking light, global warming)

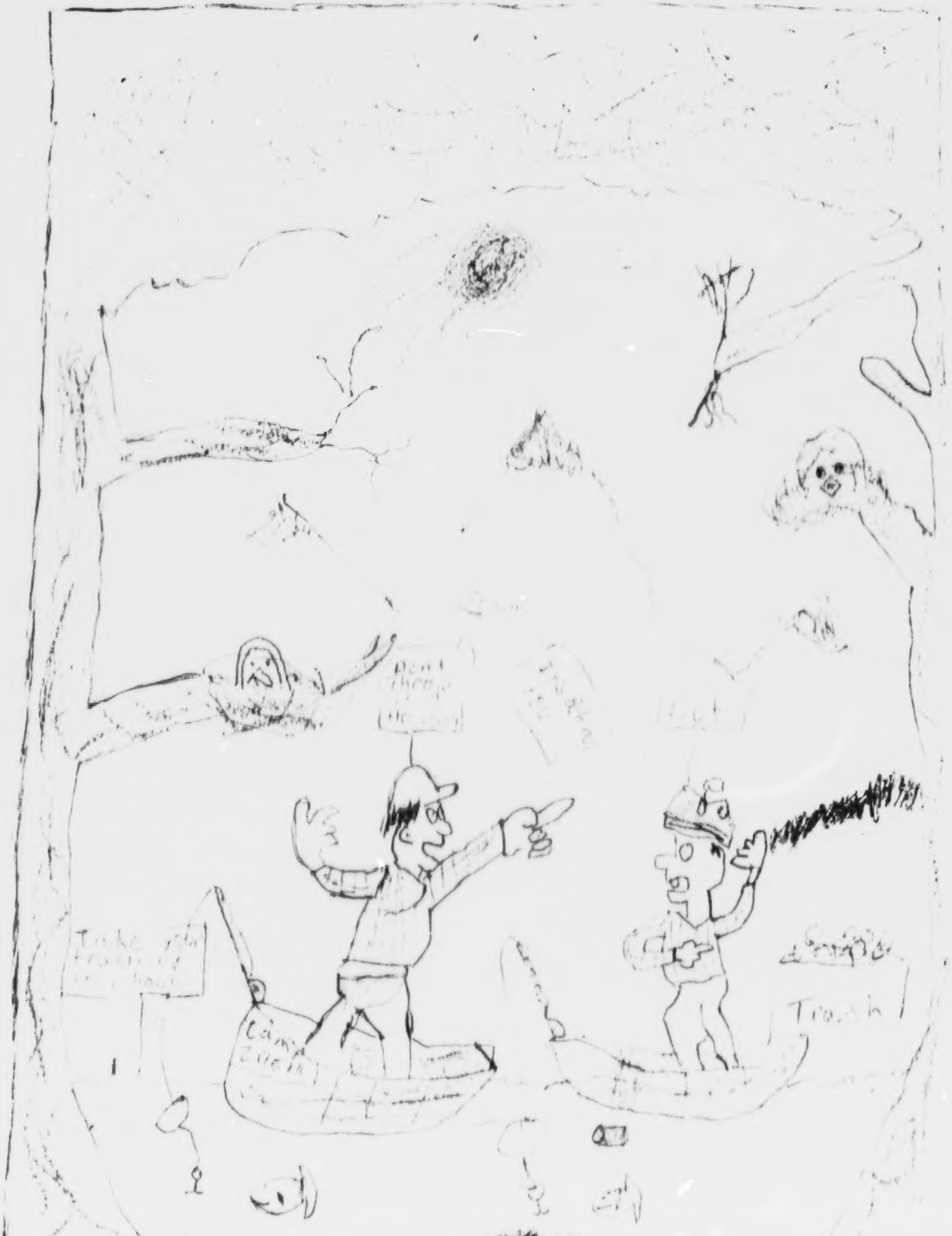
4. What if the sun were turned off? Write a story about it.

5. Where do humans fit into the food web? To what extent can we choose the place where we want to fit in?

6. What are the pros and cons of eating lower on the food chain (e.g., eating plants instead animals)? Are we using the initial energy that went into the food chain more or less efficiently?

Resources:

1. Turk, A. and Turk A., Environmental Science, Fourth Edition. 1988. Saunders College Publishing.


Don't Throw
Take
Camp
Trash

-BILLY WASHINGTON, 7TH GRADE, ANGOON

UNIT THREE: WASTE

I. Sources of Waste

A. *Lifestyles*

Objectives:

Students will:

1. Identify ways our lifestyles contribute to our country's massive trash problem.
2. Identify ways to revise our way of life to reduce the amount of waste we produce.
3. Define consumption and solid waste.
4. Learn ten ways to reduce the amount of trash generated at home.
5. Discover how traditional village life produced less trash compared to our lifestyle today.

Teacher Background:

Americans are often pictured as very wasteful in the **CONSUMPTION** of goods and materials. Every year, approximately 600,000 tons of banana peels, newspapers, automobile tires, and other items are discarded in Alaska[2]. The annual United States generation of 158 million tons of municipal **SOLID WASTE** would fill a convoy of 10-ton garbage trucks long enough to go over half the way to the moon[3]. The complexity of our way of life contributes greatly to the amount of trash we produce. If we compare our way of life to a simpler one, such as that of the early American Indian, we may be able to get some ideas on how to reduce our consumption and our waste.

Traditional Native people obtained food by hunting, gathering and fishing. They did not have as much of a disposal problem as we do because they used far fewer resources, and those few resources they used occurred naturally. Today, we can adopt traditional Native methods in order to produce smaller amounts of trash by growing our own food, using **BIODEGRADABLE** packaging and buying less processed food.

In our society, we use tools of all kinds, from disposable razor blades to electric can openers to outboard engines to microwave ovens. Once broken or worn, we often discard these items as trash. Traditional Native peoples used bows and arrows, spears, knives, scrapers, awls, needles and other tools made from **ORGANIC** materials such as bone, sinew, stone and wood.

Next time a tool or appliance is broken, instead of throwing it away, we might try to repair it. Compare the cost of repair to replacement cost. When we outgrow clothing, it goes out of style, or it gets worn, we often throw it in the trash. Native peoples would have been unlikely to throw away old clothing because materials for new clothes were hard to obtain. They might even re-sew old clothing into something new. To reduce clothing waste, we can give outgrown clothing away, not buy too much in the first place, repair worn clothing or buy durable clothing that is less susceptible to changes in style.

Here are some ways to reduce the amount of trash we produce:

- Buy food and other products from the store in bulk packaging. It saves packaging and saves you money. Use a smaller, refillable container for convenience and ease of handling.

- Recycle plastic bags at home. Use plastic grocery bags to line small wastepaper baskets; reuse the plastic bags yourself when you shop at the store.

- Avoid foam packaging. Ask your store manager to order products such as eggs in paper cartons instead of foam containers. Request that the store stock paper, NOT styrofoam hot drink cups.

- Use cloth towels instead of paper towels whenever possible. Cloth towels can be washed and used over and over.

- Don't use disposable plates, cups, utensils, or diapers unless absolutely necessary. If you must use disposable plates, use paper instead of plastic foam.

Student Activities:

1. Food packaging contributes greatly to America's trash problem. List the kinds of trash produced through the consumption of foods (cans, boxes, plastic and glass bottles, paper products, plastic bags and organic garbage).

2. List some things you can do to reduce waste in your home.

Discussion Ideas:

1. How did the traditional Native peoples obtain food? (e.g., hunting, gathering, fishing).

2. Did the traditional Native peoples have a disposal problem? What did they do about it? Why were trash problems then different from those now?

3. In what ways could we incorporate or modify traditional Native methods in order to produce smaller amounts of trash?

4. In our society, we use thousands of different kinds of tools. Once they are broken or worn, we often discard these items as trash. What tools or appliances or machines have you used and thrown away in your household?

5. What tools did traditional Native peoples use? What were those tools made of? What tools does your family use? What are those tools made of?

6. Why would traditional Native peoples have been unlikely to throw away old clothing? (hard to obtain, was re-sewn into something else, didn't have excess clothing) What might you do to reduce clothing waste?

7. Can you think of items our ancestors did not have which contribute to our trash problems? (snow machines, metal and fiberglass boats, cars, tires, newspapers, paper of all kinds, and plastic) Why do we need these things?

8. Why do we produce more trash than traditional Native people did? (we don't make our own tools and clothing or directly obtain our own food; we use more manufactured and non-biodegradable materials)

B. The Origin of Products: Raw Materials

Objectives:

Students will:

1. Learn about raw materials used to make products.
2. Understand why traditional materials did not become trash.
3. Compare traditional materials with those used today.

Teacher Background:

Alaskan Natives and American Indians lived in a much closer balance with the earth than most modern people do. Raw materials all came from the earth and returned to it at the end of their useful life, with very little processing or alteration in between.

Traditional Natives fully and wisely used the relatively few resources available to them. Trees became homes, traps, transportation and food processing utensils. Animal hides became clothing, rope, shelter and sleeping robes. Animal bones, teeth and antlers became sled runners, tools, toys and a variety of other items. Stones became pots, lamps, knife blades, pounders, scrapers, spear points and arrow heads. When a stone edge became dull or chipped, a new edge was made and the tool became smaller and smaller, was used for different purposes and eventually discarded as a stone. Sod and snow served as building blocks for winter homes. Clay and mud became vessels.

Raw materials became many products that could easily be returned to the environment without causing pollution. Families moved often and spread a small amount of waste over great distances. Animals, plants, and weather cleaned up any materials or waste that was left. Dead bodies (food animals, work animals and family members) were left to return to the environment as part of the physical and spiritual life cycle.

If we compare the low-impact use of materials of traditional Natives with our current practices, we see modern living adds many steps and procedures to the process of obtaining, using and discarding raw materials. Traditional transportation, for example, was by foot, canoe, kayak and dog sled. Canoes, kayaks and dog sleds were made from locally abundant wood and hides. Today we often travel by motor boat, snow machine, plane, ATV, car or truck. Manufacturing these modern methods of transportation requires bringing together many different materials (steel, aluminum, plastic, rubber), all of which have been created through energy-consuming processing of raw materials gathered from all over the planet.

Instead of wood, bone, hide and stone, the basic materials of modern life are ore (for metals) and petroleum (for fuel, plastics and a thousand other uses). Each step in obtaining, processing and utilizing these industrial materials uses tremendous amounts of energy and often generates some kind of hazardous waste. And what happens to modern machines when they are worn out? Can they be left to decompose back into the ground whence they came like the wood, stone and hide of traditional tools? Not usually, because modern, man-made materials often are not biodegradable or are too toxic to simply be left exposed to air and water.

Student Activities:

1. Go on a nature hike. Record the resources you see and the uses for each resource. Discuss your findings.

For example:

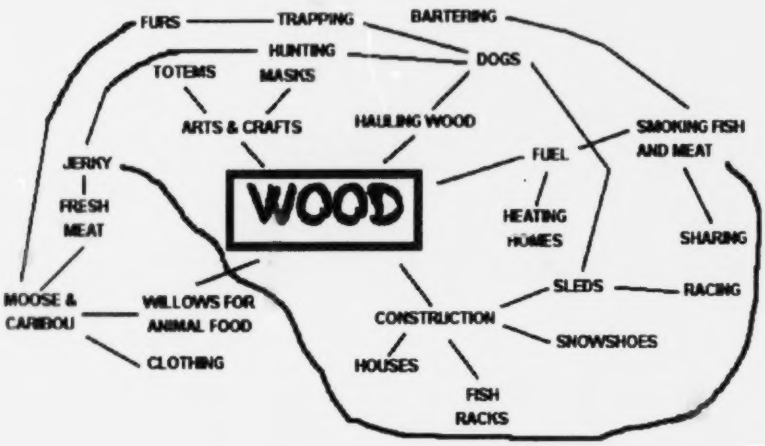
Resources	Use
tree	wood, paper
water	food (fish), transportation
bear, caribou, moose	food, clothing

2. In the classroom record the products you observe around you and their origin. Discuss your findings.

For example:

Product	Origin
desk	trees
plastic pen	petroleum
paper	trees
glass	sand

3. Divide the class into groups. Each group can draw a "map" that shows the interconnectedness of resources and activities.


FURS
TRAPPING
BARTERING
HUNTING
MASKS
TOTEMS
DOGS
ARTS & CRAFTS
HAULING WOOD
SMOKING FISH AND MEAT
JERKY
FRESH MEAT
FUEL
WOOD
HEATING HOMES
SHARING
MOOSE & CARIBOU
WILLOWS FOR ANIMAL FOOD
SLEDS
RACING
CONSTRUCTION
SNOWSHOES
CLOTHING
HOUSES
FISH RACKS

Discussion Idea:

1. Discuss this problem: "If no planes or boats come to our town, thus stopping the input of supplies, what would be the effect on our lives?" Make a list of your activities for one day and the products you use. Discuss whether they'd be available if we did, indeed, have no planes or boats.

2. Compare traditional and modern versions of everday use items (clothing, food, cooking and eating utensils, fuel, transportation, entertainment). A good one to start with might be a jacket -- students can probably easily grasp origin and processing of the materials for a traditional hide or fur parka, but how about the materials in a modern insulated nylon parka, or even a wool shirt?

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C. Processing and Manufacturing

Objectives:

Students will:

1. Learn about how resources were traditionally used.
2. Compare how raw materials are processed today with traditional methods.
3. Determine why more waste is generated now than when materials were traditionally processed.

Teacher Background:

Traditional use of natural resources and raw materials to generate usable materials did not produce the types of waste byproducts that we see today.

In traditional Native cultures, poking (putting meat and berries in seal oil or other liquids and in closed containers) for natural fermentation and preservation kept foods available through the year. Ice cellars provided natural freezers, and smoking and drying also were used to preserve foods. Sun was used to bleach skins. Preparation of skins using brains, urine, and wood tannins helped create durable clothing, shelter and rope with little waste. Information was passed from one generation to the next by the spoken word. The rigorous activities of daily life kept people physically fit. Eye and hand coordination was assured through hunting and playing games. Spiritual guidance was used for hunting success and healing the ill.

Modern life is not so simple. Food doesn't always come fresh from local land and waters -- if we eat a frozen pizza, we might be getting cheese from Wisconsin, wheat and pork from Iowa, and tomatoes from California. Today, even salmon sometimes comes from cans or frozen boxes. And we need machines to store and prepare the new type of food: refrigerators, microwaves, stoves. To access these products, we use cars, boats, planes, snow machines and ATV's, all of which require the use of highly processed materials (steel, aluminum, plastic, gas, oil) from all over the world.

Clothing is now manufactured from highly processed materials and obtained by mail order rather than created at home out of locally available resources. The modern system requires use of packaging and shipping resources, and the clothing and other goods we order often become waste as styles rapidly change or equipment breaks or becomes obsolete.

Communication is far different today, as well, with T.V., radio, books, magazines and newspapers replacing our oral tradition. These new forms of communication all require precious resources to produce.

Student Activities:

1. Materials/Processing Flow Chart
   a. Bring a packaged food item to school.
   b. Take the item apart and arrange each part along the top of a poster board.
   c. Write down the stages in processing below each part.
   d. Use arrows between each stage and indicate the type of transportation used.

   Draw another flow chart showing processes involved in the production of a local food. This comparison process can be repeated for other items. Compare the materials and processes used to create a kayak versus a motor boat, or a TV show versus a traditional story. Flow charts for modern procucts will be unbelievably long if you take care to include all processes and materials.

2. Materials Trace: The Wooden Toy
   Materials: Household products brought in by students

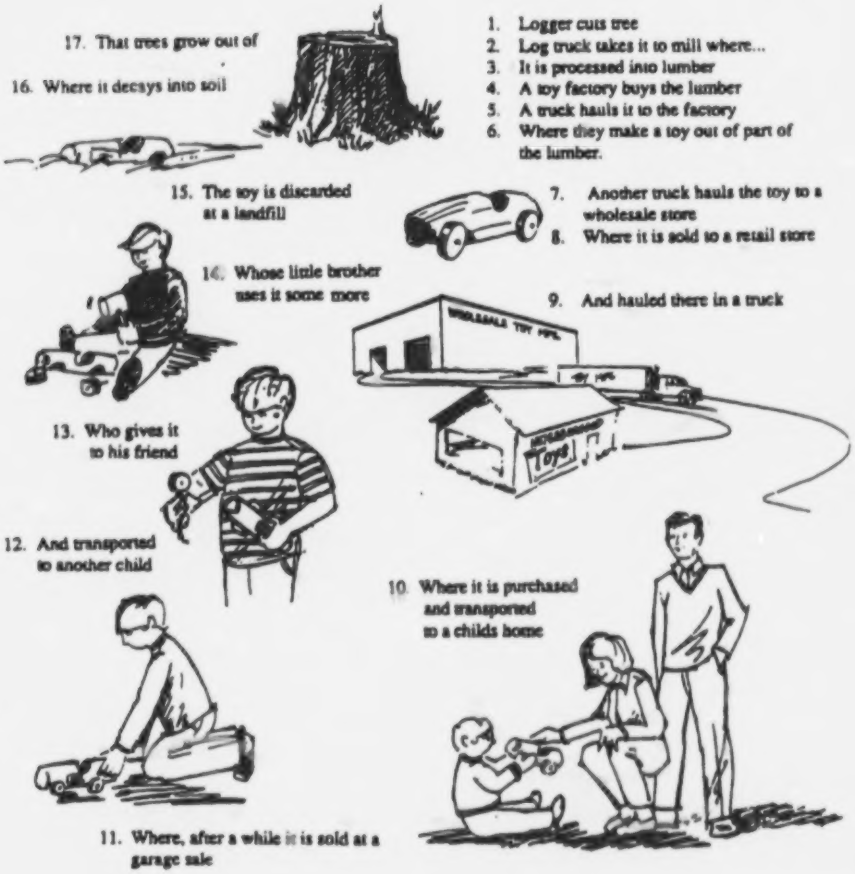
   Ask each student to bring in three products that are common household items. Each student will choose one of the items and identify all of the necessary steps to produce a finished product from the raw material. Then each will trace all the steps necessary to recycle the finished product back to its source. Trace this life cycle on the chalkboard or on a large piece of paper.

   The example cycle of a wooden toy (see illustration on next page) can demonstrate that some waste may decompose to become nutrients for other generations of plants or animals. However, it should be noted that generally, in many parts of Alaska, decomposition rates are extremely slow because of cold soil temperatures.

Discussion Ideas:

1. When the students have completed diagrams for the materials trace activity, discuss the following:

    - What wastes are made when the product is manufactured?
    - How many times was it transported? By what?
    - What energy was required to obtain, transport and process the raw materials for the product? What energy was required to manufacture and transport the final product?
    - How easy is it to recycle?
    - Do the items you bought get reused by a second person?
    - What wastes are produced in the recycling process?
    - What are some of the environmental effects of the processing? Of the transport?


17. That trees grow out of
16. Where it decays into soil
1. Logger cuts tree
2. Log truck takes it to mill where...
3. It is processed into lumber
4. A toy factory buys the lumber
5. A truck hauls it to the factory
6. Where they make a toy out of part of the lumber.
15. The toy is discarded at a landfill
7. Another truck hauls the toy to a wholesale store
8. Where it is sold to a retail store
14. Whose little brother uses it some more
9. And hauled there in a truck
Toys
13. Who gives it to his friend
12. And transported to another child
10. Where it is purchased and transported to a childs home
11. Where, after a while it is sold at a garage sale

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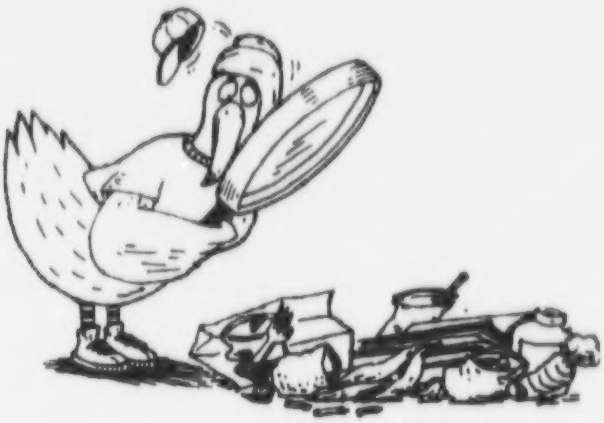
II. Types of Waste

A. Solid Waste: Be a Garbage Detective



Objectives:

Students will:

1. Define solid waste (garbage) and become aware of what happens to it after disposal.
2. Discuss why garbage is a problem and how to reduce waste.
3. Compare the amount of waste produced by Alaskans with the amount produced by people from the rest of the U.S. and other countries.

Teacher Background:

All living creatures produce some sort of waste. Humans are the most wasteful creatures on earth and often are not concerned about the consequences of human garbage. Statistics show that humans living in developed areas create far more trash than those who live in undeveloped countries. The list below shows that the United States average is 3.6 pounds of trash per day per person, while in underdeveloped nations, such as Mexico, the number is far less, .9 pounds per person per day, on average. Contrast this with the average Alaskan, who generates approximately 6 pounds of trash per day!

Pounds of waste per person per day:

INTERNATIONAL[1]	
Mexico City	0.9
Japan	2.2
Northwest Territories, Canada	2.5
U.S. National Average	3.6

ALASKA[5-9]	
Juneau	5.3
Anchorage	5.9
Petersburg	6.6
Kenai Peninsula Borough	6.0
Unalaska (includes fishing industry waste)	27

VESSELS[10]	
Dutch Harbor trawler	11
Boat in harbor	2.2
Boat out of harbor	3.3

Student Activities:

1. Ask each student to draw two pictures. One picture should be of his/her house. The other should be of a moose's, deer's, bear's or beaver's "house." Ask students to look at their pictures and think about garbage. What is garbage? Do animals have to deal with garbage? Why do people have so much more garbage than animals? How do people get rid of garbage? Where does it go? How do animals get rid of their garbage? What are other sources of solid waste in the village besides households?

2. Have students go through magazines and find pictures of things that get thrown away after only one use. Students can create a big collage or many small collages by pasting up the pictures. Talk about why there's a market for disposable products and why and how we might try to avoid using them.

3. Interview an Elder about lifestyles when they were young; how much garbage did they generate, and what did they do with it?

Discussion Ideas:

1. What is garbage? Where does it come from? Where does it go? Is it necessary?

2. Why do people create so much more waste than plants or animals? Why do Alaskans create more waste than other Americans? Why do Americans create more waste than people in third world countries?

3. How can we reduce the waste we make? Do we need to accept certain levels of waste in our village, state, country or world? How could we determine acceptable waste levels? Would it be possible for our modern culture to be "wasteless?"

Resources:

1. Video tape: Life Before Litter, Ohio Department of Natural Resources, Office of Litter Control. 8 min.

2. Hughey, Pat. Scavengers and Decomposers: The Cleanup Crew. New York, N.Y.: Atheneum Publishers, 1984.

B. Pollution

Objectives:

Students will:

1. Learn about and be able to give examples of air, water and land pollution.
2. Learn about and be able to give examples of visual, noise and thermal pollution.
3. Investigate oil spills that have occurred in or near villages.

Teacher Background:

There are many types of **POLLUTION**, or potentially damaging impurities or waste. Air, water and land or soil pollution are the predominant categories. Examples of outdoor air pollution include volcanic ash, dust, wood smoke, power plant exhaust and smoke from burning trash. Indoor air pollution can occur due to the presence of formaldehyde, microbes, water vapor, wood or tobacco smoke, nitrogen oxides, carbon monoxide, hydrocarbons, radon or fiberglass. Water and land can become polluted from a variety of sources, including chemicals used to separate gold from ore, spilled or leaking fuel, sewage, pesticides and used oil.

It is often difficult to find the source of a pollution problem and to clean up the contamination. Land, water and air can be contaminated by sources many miles away. A prominent example of this phenomenon is the acid rain caused by air pollution in the industrial east of the U.S. -- air pollution from factories hundreds of miles away has resulted in the deaths of fish and other aquatic life in lakes throughout the northeastern U.S. and eastern Canada.

More recently, noise, visual and thermal pollution have become concerns. Thermal pollution is a reduction in the quality of air or water by an increase in temperature. For example, a river in the interior would naturally freeze during the winter, but warm waste discharged into that river keeps it unfrozen, thus changing the entire ecosystem. Noise and visual pollution refer to unpleasant sounds (horns honking, loud machinery, etc.) and unpleasant, unnatural three-dimensional structures (billboards, signposts, etc.). Hearing loss is a consequence of noise pollution. The use of snow machines, chain saws, heavy equipment, airplanes, boats and generators has contributed to this problem. Hearing protection devices can reduce the noise that reaches the inner ear to safe levels.

These many different types of pollution have a common result...damage to a formerly healthy, natural and pure ecosystem.

Student Activities:

1. To detect various levels of air pollution, coat one side of a piece of white cardboard with petroleum jelly on a Monday and leave it outside until Friday. Analyze the color of the petroleum jelly after five days to determine what, if any, pollutants may have collected.

2. Collect a local water sample from a lake, pond, river or faucet and look at it under a microscope.

3. Look at newspaper articles about oil spills in Native villages. Discuss what pollution problems are evident in each article. How could the spill have been prevented? How would you know if your water or soil is contaminated with oil? What would you do if this happened in your village?

4. Investigate noise levels in and around the village. Where and when can you and your students find complete absence of man-made sounds (even "sneaky" sounds we don't usually notice, like the hum of a refrigerator or the purr of a distant engine). Take your students on a walk around the village and map the quietest and loudest places. How far must you and your class walk outside the village until you can hear no man-made sounds?

5. Identify sources of all types of pollution in your village. Did Natives create any pollution before the introduction of outside technology and lifestyles?

Discussion Ideas:

1. Does pollution of some kind affect you on a daily basis, even in rural Alaska? What kind(s) of pollution are you affected by? What do you think is the biggest pollution threat to your village?

2. Sometimes a car, truck, motorcycle or snow machine emits excessive pollution. What does that extra-thick, stinky black smoke tell the vehicle's operator? (In addition to unpleasant smells and sounds, excessive exhaust = poorly operating engine = inefficient combustion = wasteful use of non-renewable resources.) What's the relationship between pollution, inefficiency and waste?

3. Local, state and federal governments set standards for acceptable levels of most kinds of pollution. Why must the government set pollution standards? Why would people need to be told

not to pollute the very world they live in, not to foul their own nest? Is it OK to accept certain levels of pollution, even if those levels may harm us? How do we benefit from accepting certain levels of all kinds of pollution (air, land, water, noise, visual, thermal)?

Resources:

1. Indoor Air Pollution - In Alaska Homes? The American Lung Association of Alaska. (See brochure in the Supplemental Materials Section.)
2. The Alaska Health Project has a toll free hotline to answer any additional questions you may have about various types of pollution. Dial 800-478-2864 from within Alaska, or 276-2864 from Anchorage.
3. The Air We Breathe is a 30-minute video available from the Tanana District of the Cooperative Extension Service at 1514 S. Cushman, Rm. 303, Fairbanks, AK 99701. Send a refundable check for $5.00 to this address. They will send you the video. When you return the video, they will send back your check.

C. Hazardous Waste

Objectives:

Students will:

1. Learn fundamental characteristics of hazardous waste.
2. Discuss why and how people would want to use potentially hazardous chemicals.
3. Identify possible sources of hazardous waste in their homes and understand warning labels on hazardous items.
4. Learn key terms, such as: flammable, corrosive, explosive, toxic and reactive.

Teacher Background:

Hazardous wastes are solid or liquid materials having certain properties that endanger human health and the environment. Hazardous wastes are generated both by industrial processes and from the use of products in or around the home. Waste is hazardous if it is:

CORROSIVE: capable of chemically eroding another substance, such as skin, cloth or metal. (Examples: battery acid, drain cleaners)
TOXIC: directly or indirectly poisonous to living things. (Examples: drain cleaners, antifreeze, herbicides)
FLAMMABLE: capable of catching fire. (Examples: gasoline, paint thinner)
REACTIVE: capable of creating a violent or rapid chemical reaction. (Examples: chlorine, ammonia)

EXPLOSIVE: capable of exploding if exposed to spark, flame or being hit sharply. (Examples: gunpowder, bottled gas)

Examples of industrial hazardous wastes include fixer from photo developing labs, filtration residues from dry cleaning businesses, ink used in printing processes -- the list could go on for pages. Almost any time a toxic chemical or substance is used in the quantities necessary for industry, some residue is left over. This residue becomes hazardous waste.

While students should be aware of the hazardous wastes generated by industry, this unit will focus on household hazardous wastes. We use many potentially hazardous products every day; by being aware of these hazards, students can work to minimize the impact of such waste in their community. Examples of household hazardous wastes include antifreeze, brake fluid, degreasers, engine cleaners, used motor oil, herbicides, insecticides, wood preservatives, paints, thinners, paint strippers, rust removers, solvents, drain cleaners, septic cleaners, fingernail polish remover, some medicines and arts and crafts chemicals.

Problems with household hazardous waste result mainly from the consumer's ignorance of the dangers of common household products. Most media attention on hazardous waste has focused on large-scale problems resulting from industry. An overturned train laden with deadly pesticides just makes a better story than somebody dumping used oil and antifreeze behind their house. However, the cumulative effect of a hundred, thousand or million people improperly dumping oil, antifreeze and other hazardous wastes is very significant.

Hazardous waste can be dangerous both to humans and to our ecosystem as a whole if not handled properly. There are two important principles to keep in mind when disposing of hazardous waste. First, consider what will happen to the waste one, five, fifteen and fifty years from now. Will it get into your water? Will it travel downstream or out to sea and contaminate animals or fish you may one day catch and eat? Second, consider that while the small bit of waste you're dumping may be insignificant, there are millions of other people doing the same thing, and the cumulative effect is devastating. We think nothing of standing over an engine as we pour gas into the tank from a canister, yet in Los Angeles and other densely populated areas, gas fumes are such a problem that gas stations must now equip their pumps with nozzles designed to eliminate the escape of gas fumes into the air.

Because some products are potentially dangerous in their use or as waste, the government makes companies put warning labels on their containers. There are three kinds of labels on potentially hazardous products used in the home. The labels contain the words **CAUTION**, **WARNING**, and **DANGER**. **Caution** means an ounce to a pint would make you sick and possibly kill you. **Warning** means only a spoonful would get you sick and might kill you. **Danger** means as little as a taste could cause death. Some labels might also bear the word **CARCINOGEN**. **Carcinogen** means breathing, touching, or eating the substance increases the risk of cancer for the rest of your life. Read the label. Containers that say only "CAUTION" are still poisons.

Potentially hazardous products do not necessarily work better than safer, less toxic products. Deciding which product is the best to use is not easy. It helps to decide what the results need to be. For example, how clean is clean? Should the floor and sink be washed every day, every week, or once a month? Will baking soda and soap be good enough to clean the kitchen floor? How much solvent does it take to wash out a paint brush? Choose products that are safe to use. When cleaning or washing something, try soaking it first in a bucket of hot water. More time and temperature make most cleaning jobs easier.

Encourage students to think about why they buy products containing dangerous chemicals. An example of a common household product that is also hazardous is fingernail polish remover, which contains fairly toxic chemical solvents. Removing nail polish is very difficult without using solvents. Students should ask themselves, "Why do I use fingernail polish? What would happen if I left my fingernails natural?"

Some chemicals are difficult to find alternatives for. Batteries need acid. Snow machines need gas. Generators need oil. One step to take is finding out how to use less. Taking care to not drop or break a battery will make it last a lot longer. Planning trips with others will reduce gas and oil use.

Our fast-paced modern culture relies on the use of many hazardous or potentially hazardous materials. However, by minimizing their use and following proper disposal procedures, we can minimize the impact of hazardous wastes on the environment (and thus on ourselves).

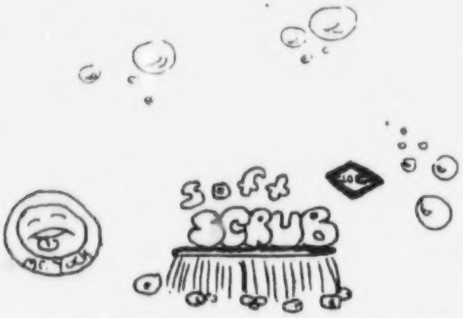
Here are some basic guidelines for hazardous materials use and disposal:

- Buy and use only enough for the job;
- Use non-hazardous alternatives whenever possible;
- Read labels carefully -- follow directions for use and disposal;
- Never bury or dump waste on the ground. Never pour waste down a drain or into the water.

Student Activities:

1. Ask someone who works regularly with hazardous materials to come and speak to your class about his or her experiences. (Most firefighters are trained to deal with hazardous materials.)

2. Ask the students to bring in a picture of a product in their home that they think is hazardous. Classify the products according to the categories outlined in the "Teacher Background." After this, have students make a list of all products at home that might be hazardous. Whose house has the most hazardous items? Whose the least?



Cleanser with mild abrasive

CAUTION: EYE IRRATENT, IF in eye
call physician, wash eye, keep
out of reach of children, skin
irratent.

3. Split the room into groups. Give each group four different shapes, such as a circle, triangle, square, etc. Have each group design four labels for a dangerous chemical. One label can use only colors. The second, colors and numbers. The third, only words. The fourth label can use any or all elements. Spread the labels out on a table in the back of the room and discuss the effectiveness of various designs.

Discussion Ideas:

1. If you found a can of unlabeled chemicals, what would you do with it?

2. What kind of label would you put on a chemical container to warn other people? What colors would you use on the label?

3. What are some household products which you think are dangerous or hazardous?

4. Name all the products which can be used to clean any part of a

bathroom. Which are potentially hazardous to your health? How did you identify the hazardous products? A sharp smell? A warning label?

5. Name all the products which are used to run and repair snow machines, outboards and other engines. Might some of these products be hazardous or potentially hazardous? What happens to oil taken from an engine? What happens to solvents used to clean machine parts? What hazards to your health could there be if you inhaled or swallowed some of these products?

6. What kind of protective equipment is needed for workers cleaning up hazardous waste?

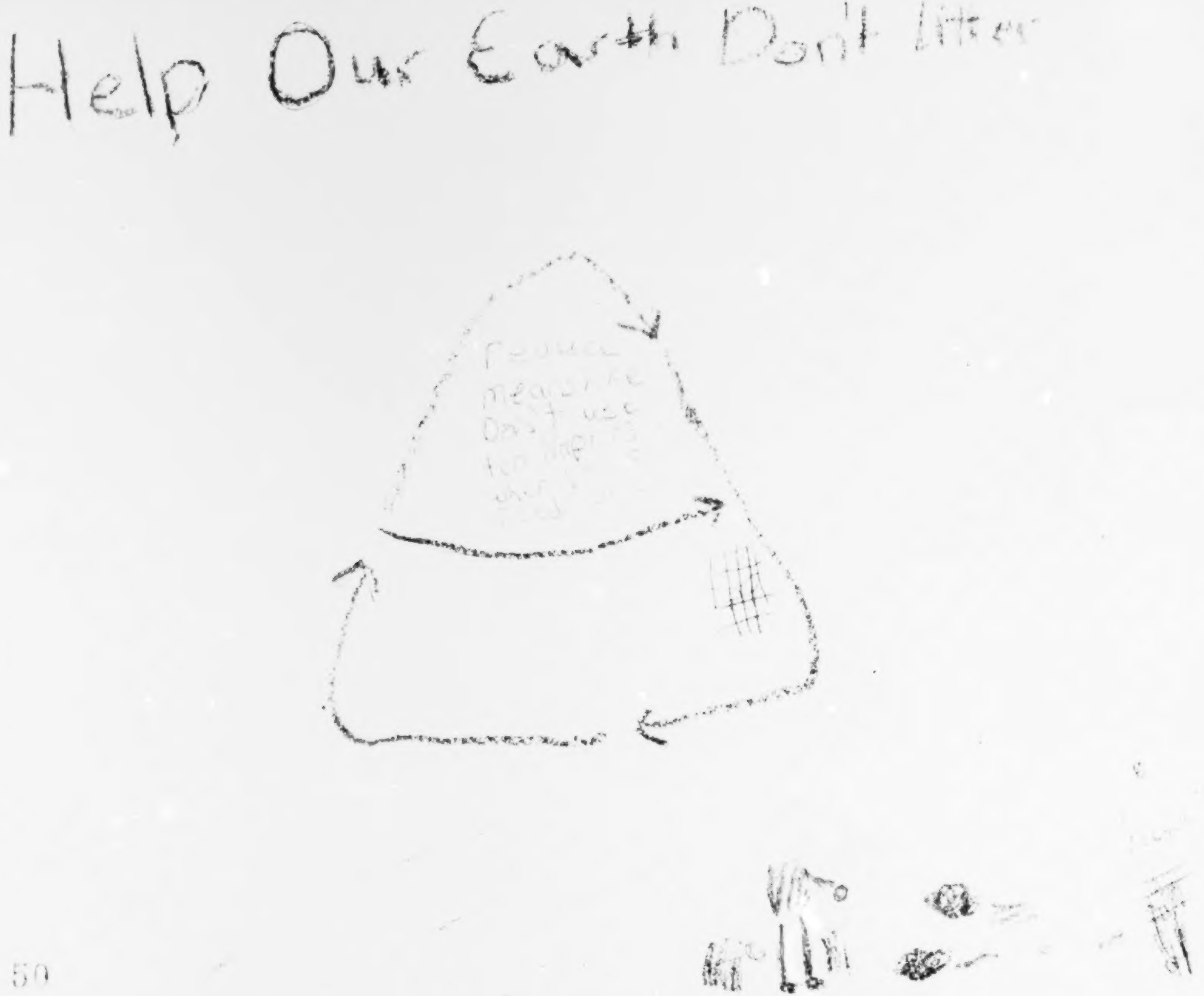
7. Where should hazardous wastes be dumped? How can we ensure that they don't get into our water or food?

8. What might happen to hazardous waste dumped into a river? What might happen to waste buried or dumped on the ground?

9. Consider this fictional problem: A seal slaughtered in the Bering Sea is found to have high concentrations of pesticides in its fat. This seal is known not to have strayed far from northern waters throughout its life, and there is only an infinitesimal concentration of such pesticides in those waters. Where did the pesticides come from?

Resources:

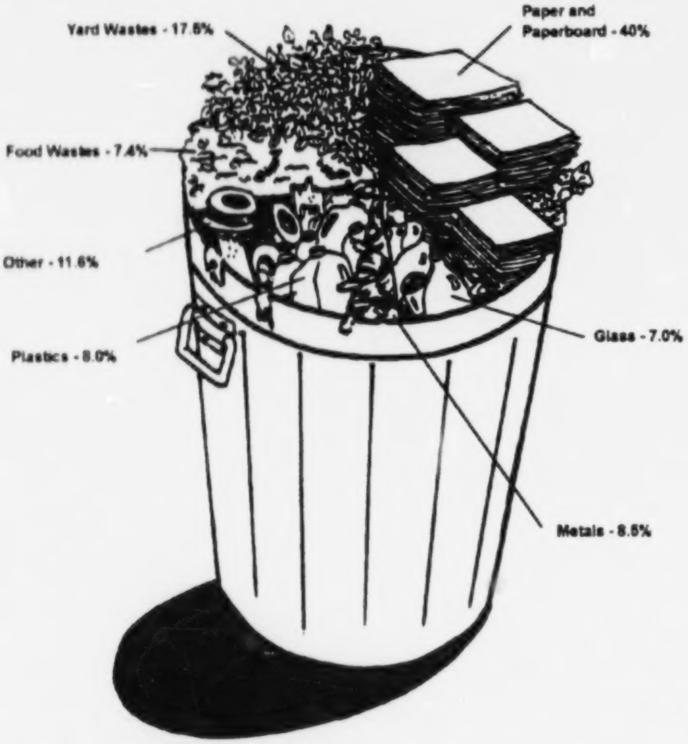
1. A Manual for the Household Hazardous Materials Audit. 1987. By Kristine Benson, published by Alaska Center for the Environment, 519 W. 8th, Anchorage, AK 99501 (274-3621), see chapter 1.
2. Locate newspaper articles and discuss: Kenai chlorine leak, deaths from methanol poisoning in Wainwright, death of child in Pt. Hope and nearby drums, Nome playground contamination, Minto school drinking water contamination, Homer school drinking water contamination, Chugiak school drinking water contamination, Skagway school lead contamination in carpeting, Sitka school dioxin contamination, Juneau playground school yard mine tailings contamination, Red Devil contamination, North Pole high school and MAPCO ground water contamination, Fairbanks school playground contamination.
3. Contact the Alaska Health Project (800-478-2864) for additional information about specific hazardous chemicals.


Help Our Earth Don't litter
reduce
means like
Don't use
too many

-MELANIE WHOLECHEESE, 4TH GRADE, ALLAKAKET AK

UNIT FOUR: REDUCE

I. Source Reduction - Tracking Your Trash



Objectives:

Students will:

1. Learn the importance of reducing the quantity and toxicity of the waste they produce.
2. Gain an understanding of the resources required to produce newspapers and packaging.
3. Track their trash to determine how much trash they produce.

Teacher Background:

Reducing waste before it is made is called **SOURCE REDUCTION**. This is the most "eco-logical" way to reduce waste — doesn't it make sense to stop as much pollution as possible before it starts? Sources of pollution can include cars, factories, sewers and litterbugs. Did you ever think of yourself or your students as a pollution source? When you throw something away, you become a pollution source.

Source reduction can include both decreasing the amount of waste and the **TOXICITY** (harmful ingredients) of waste. Source reduction does not include recycling, because while recycling is beneficial, it takes place after the waste is already made. It is better to reduce waste at the source. Recycling should be secondary to source reduction as a means of decreasing waste.

As an exercise in thinking about why source reduction is the preferred method of reducing waste, consider the materials and energy required to make one ton of paper packaging[11]:

3,668 lbs. wood
216 lbs. lime
360 lbs. salt cake
76 lbs. soda ash
24,000 gals. water
28 million btu's energy

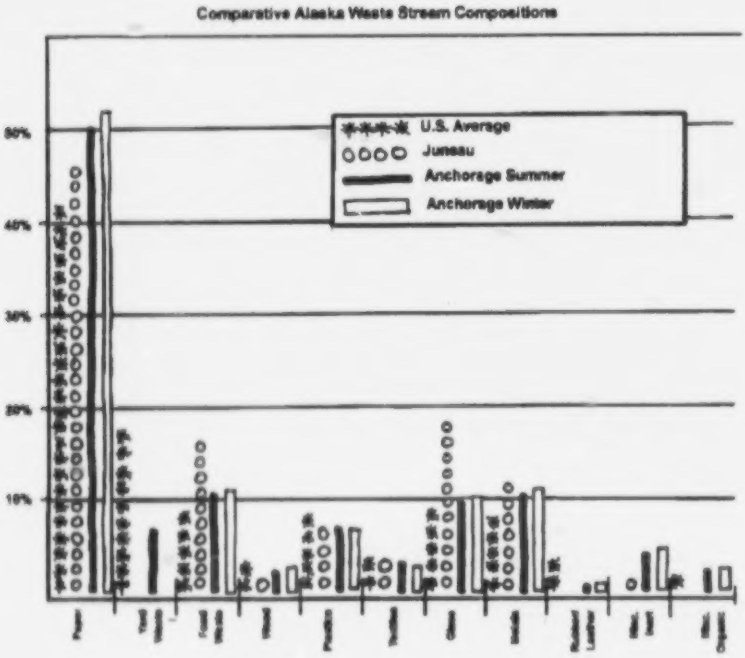
That means for every pound of paper packaging we use, we're really using 1.8 pounds of wood, 1.6 ounces of lime, 2.8 ounces of salt, .6 ounces of ash, 12 gallons of water and 14,000 btu's.

Where does all of this trash go? We take it to the dump or the garbage collector picks it up and it's gone. But where? When trash is burned, harmful **POLLUTANTS** are released into the air. Putting garbage onto or into the ground has its problems, as well. **LANDFILLS** in villages are often leaking into nearby rivers or ponds. There is no truly safe or out-of-the-way place to put our solid waste. Our only long-term alternative is to stop making so much trash.

By reducing the amount of trash they produce, students can set an example for family, friends and the rest of the community. There are many simple ways to reduce waste at the source. For example, some businesses now use the back of paper that's already been used once for copies and computer output that stay inside the office or don't not have to be "final draft" quality. This simple step can result in a 20 to 30 percent source reduction in paper use. An old saying applies to the new problem of waste reduction: "Use it up, wear it out, make it do or do without."

Student Activities:

1. Analyzing a Waste Stream
A waste stream (total waste generated by a community or system) can be broken down into components. Analyzing a waste stream in this way can help identify the types and amounts of waste in a given community. By identifying what types of waste are the biggest contributors to the waste stream, we can determine the most appropriate wastes to target in our source reduction and recycling efforts. The following chart depicts the U.S. average, Juneau, Anchorage summer and Anchorage winter waste streams.



(From: Municipal Solid Waste: A Resource Assessment for Energy Recovery in Alaska. By Rick Rogers, Alaska Energy Authority. Sept. 1991.)

The information in this chart raises some interesting questions you can address with your students. For example, why do Juneau and Anchorage contribute more paper to the waste stream than the rest of the U.S? Why does Juneau's waste stream have so much glass in it? Why does Juneau generate more food waste? What about the discrepancy in yard waste between the rest of the U.S. and the Alaskan cities? What element of the waste stream needs the most attention in terms of source reduction and recycling?

You can analyze your classroom's waste stream. Checking the composition of your trash for a week should yield an accurate representation — one or two days is not enough time. You can separate trash at the end of the day from one big bin, but it might be easier to create separate bins for the different categories you and the class decide on. At the end of the week, create a chart like the one above for your classroom's waste stream. How does it compare with the U.S. average and with the Alaskan cities?

An interesting side lesson in this activity has to do with units of measurement. Try measuring the different elements of the classroom's waste stream by volume and by weight. Graph your waste stream using both measurements — how do the graphs compare?

2. How Much Do I Throw Away?

If you've done activity one, students will have a fairly good idea of how much and what kind of trash their class produces. But they still may not have a good understanding of how much they personally throw away, and how much of that may be reusable. This activity should raise awareness of personal habits.

a. Place the following chart on a bulletin board or wall near basket for waste paper at a height easily accessible to students. No food wastes should be disposed of in basket(s). Provide a small container for food wastes.

Monday											
Tuesday											
Wednesday											
Thursday											
Friday											

b. Ask students to write their initials and what they discarded in the appropriate space every time they discard something.

c. At the end of the week, have students form small groups and respond to the following, drawing a bar graph from the results:

- What types of things were thrown away?
- Approximately what percent of what was thrown out was reusable or recyclable paper?
- What additional uses could have been found for this paper?

d. Have groups compare their lists of composition, estimated percentages, and alternate uses for discards.

e. Have students, working in large groups, draw large butcher paper graphs plotting days on the horizontal axis and the number of visits to the waste basket on a vertical axis. Students can create a graph depicting visits for the entire class and for themselves individually — what's the average number or trips per day?

f. Discuss and compare the results as reflected on the bar graphs. Emphasize the effect awareness and informed decision making can have on the reuse or recycling of paper and on "doing without the can."

Discussion Ideas:

1. Ask students to think of themselves as sources of waste. Do they produce all three kinds of waste (solid waste, pollution, hazardous waste)? Who produces the most waste in their families? Why? Which wastes could be reduced at the source, and how?

2. Choose four or five jobs that people do in your community (teacher, fisherman, mechanic, artist, etc.) Which produces the most waste and which the least?

3. How can students reduce waste at the source at home, at school, at fish camp, etc?

II. Better Buying - Understanding Packaging

Objectives:

Students will:

1. Learn the purpose of packaging.
2. Identify natural resources used in packaging and understand how these resources can be conserved through careful buying and recycling.
3. Identify wasteful packaging and suggest alternatives to poorly packaged items.
4. Identify steps that can be taken to affect the packaging options available in the marketplace.
5. Identify packaging made from recycled materials.
6. Make suggestions on how to reduce the amount of packaging they bring home from the store.

Teacher Background:

Both the type and amount of packaging used for our food is a major environmental concern. Packaging uses energy and raw materials and almost always ends up as waste. In industrial countries, packaging contributes about 30 percent of the weight and 50 percent of the volume of household waste.

Packaging also adds to the cost of goods. Nearly $1 out of every $10 spent for food and beverages in the United States pays for packaging. The packaging bill in 1986 in the United States totaled $28 billion. Americans spent more for food packaging in 1986 than farmers received in income[12].

Why all the packaging? Large food companies sell more and more to wide geographic markets. For ease in shipping and marketing over long distances, foods formerly sold "loose" or "bulk" are now packaged, enclosed in an endless array of envelopes, bags, pouches, and boxes within still larger boxes and cartons.

Packaging has increased not just in volume but in sophistication as well. Our eat-on-the-run society demands meals that take minutes to prepare. We choose from a wide selection of frozen entrees, snack items, juices, soft drinks, instant soup, etc. Most are excessively wrapped or packaged, supposedly as a convenience to the consumer. Once used, the product's "convenient" packaging is designed to be tossed in the trash. While this may be convenient in the short run, it is costly and wastes energy resources.

Careful buying is the first solution to the problem of too much solid waste. An individual's careful buying decisions can significantly reduce the volume of household waste. Approximately 50 percent (by volume) of household waste consists of containers and packaging[13] — responsible buying can reduce Alaska's waste stream.

We can make simple, easy choices when shopping that will significantly reduce waste: we can buy bulk oatmeal instead of indiviually wrapped packages; we can buy a big bag of popcorn rather than a cardboard box full of individually wrapped bags; we can buy one large can of tuna rather than four small ones -- the list goes on and on. If many of us make these simple smart choices, we can make a huge reduction in the amount of waste we create.

Students need to know that they can make a difference. At the Poplar Middle School on the Fort Peck Indian Reservation, a small group of students found a way to help the environment, reduce waste and save money. They convinced their school district to stop using styrofoam, which emits chloroflurocarbons, compounds that contribute to the destruction of the ozone layer.

To consume, in the modern sense, means to destroy, to waste, to use up. James Spencer III, a student at Poplar Middle School, wrote down these reflections on what it means to consume: "I thought to myself, that's exactly what we have done to our environment. We have destroyed. We have wasted. We have practically used up all the benefits of our environment. We haven't thought much about the future of our environment." There is no Sioux word for "consume." The Cherokee word for consume means to "use it wisely and put it back." James thinks that "we need a definition in the Webster Dictionary . . . that teaches us to take care of the environment. A definition that teaches us not to destroy; not to waste; and not to use it all up." We can all work toward a healthier, less wasteful form of consumption, and a good first step would be to reduce the amount of packaging we buy and throw away.

- Limit prepackaged and precooked foods. Cooking with mixes saves energy, costs less, and is more nutritious.
- Use durable shopping bags, strings bags, and knapsacks as alternatives to plastic sacks.
- Talk to parents/community members about avoiding over-packaged materials.

Take steps to change marketing practices, including:

- Don't buy over-packaged products;
- Write letters to manufacturers suggesting changes in amount or design of packaging;
- Write letters to packaging companies urging increased use of recycled/recyclable materials in packaging.

Student Activities:

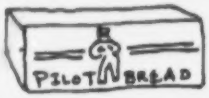
1. Analyzing Packaging

Have students bring in packages from home. The students can then:

COOKIE
MONSTER

CORN
FLAKIES
YUM!

PEANUT
BUTTER



a. Group similar packages into piles. Some possible methods of sorting are:

Type of food;
By materials (glass, aluminum, paper, etc.);
Necessary or wasteful packaging;
Kind of package (box, carton, bottle, can, etc.);
Purpose of packaging.

b. List the 5 most reasonable packages. Give reasons for your choices.

c. List the 5 worst packages. Give reasons for your choices.

d. Have each student write a letter to the manufacturer of the product they feel to be the worst packaged. The letter should ask why the company uses wasteful packaging and should stress that some consumers prefer less wasteful packaging and use of recycled materials.

e. Have each student write a letter of praise to the manufacturer of the product they feel is best packaged, commending the the company for "doing good" in their avoidance of over-packaging and/or their wise use of recycled materials.

2. Compare the amount of packaging required for the same amount of a given food in bulk and packaged form. For example, how much packaging is required for 16 ounces of bulk oatmeal versus 16 ounces of instant oatmeal individually wrapped and boxed? Measure both volume and weight of packaging.

3. Compare prices from various sources (mail order) for basic products: flour, rice, macaroni, cereal, sugar, laundry detergent, etc. What happens to prices as package size increases or decreases?

4. Brainstorm ideas to reduce waste in your village. Identify 5-6 ways you can reduce food packaging waste in your home. (Think source reduction: have students talk to local merchants about carrying bulk foods and talk to their parents about the disadvantages of buying convenience foods.)

Discussion Ideas:

1. Why do we sometimes need packaging on the things we buy? Which products need the protection of packaging? Which products need packaging to protect public health, prevent theft, provide advertising or convenience, etc.?

2. How might you influence manufacturers, wholesalers and retailers of packaging to take into account the waste disposal and resource use issues and problems related to packaging?

3. How does recycling help grocery stores cut disposal costs?

4. How can you reduce the amount of packaging you throw away?

5. How can you tell which paper packaging has been made from recycled materials? (Look for the recycling emblem, and if the paperboard is grey, it was probably made from recycled paper.)

6. What are the advantages to buying larger quantity packages? (A 3-oz. tube of toothpaste requires 50 percent more packaging per ounce than the 7-oz. size.)

7. Using different packages as examples, address these questions:
   - Which natural resources were used to make the packaging?
   - Could the package have been made to be more conservative of resources or energy?

8. What's the Cost of Packaging and Processing?

A POTATO BY ANY OTHER NAME*

PRODUCT	PACKAGE SIZE	PRICE	PRICE PER POUND
Russet potatoes	bulk		.79
White potatoes	bulk		.69
Red potatoes	bulk		.59
Fresh potatoes	5 lb.	1.99	.40
Fresh potatoes	10 lb.	2.99	.30
Fresh potatoes	15 lb.	3.99	.27
Bel Air hash browns	1 lb 8 oz	1.69	1.13
Bel Air french fries	2 lb	1.95	.98
Bel Air shoe string potatoes	20 oz	1.69	1.35
Ore-ida potatoes obrien	32 oz	2.09	1.05
Ore-ida golden fries	32 oz	2.29	1.15
Ore-ida dinner fries	24 oz	2.49	1.66
Betty Crocker potato buds	28 oz	2.95	1.69
Betty Crocker potato buds	13.75 oz	1.79	2.08
Townhouse mashed potatoes	16 oz	1.79	1.79
Townhouse white potatoes (can)	15 oz	.79	.84
S&W white potatoes (can)	16 oz	.75	.75
O'Boises potato chips	6.5 oz	.99	2.44
Eagle potato chips	6.5 oz	2.29	5.64
Pringles	7 oz	1.79	4.09
Lays potato chips	7 oz	2.65	6.06
Lays potato chips	14.5 oz	4.39	4.84
Ruffles potato chips	15 oz	4.59	4.90

* items priced in Fairbanks, 10 July 1992.

NOTE: Price per pound listing can often be found on shelf labels beneath products. Analyze and discuss your findings:

Using the table above, discuss the effect of processing and packaging on price, waste and nutrition

a. What effects do processing and packaging have on a product's cost?

b. What effect does package size have on price?
c. What effect does package size have on the amount of waste?

Resources:

1. Ferrand, Trisha L. "Packaging Interests Begin Planning for Recycling." Resource Recycling. July 1988, Vol. 7, No. 3.
2. Ferrand, Trisha L. "Packaging Interests Face Recycling." Resource Recycling. Jan.-Feb. 1988, Vol. 3, No. 1.
3. Franklin Associates LTD., Characterization of Municipal Solid Waste in the United States 1960 to 2000 Update 1988. Prairie Village, KS.: Franklin Associates LTD., 1988.
4. Pollack-Shea, Cynthia. "Realizing Recycling's Potential." State of the World 1987. New York, N.Y.: W.W. Norton & Company, 1987.
5. Powell, Jerry. "Packaging Under Attack: The Waste War." Resource Recycling. May-June 1989, Vol.8, No. 2.
6. Sherman, Nancy J. "Foodservice Disposables and the Solid Waste Challenge." Resource Recovery. February 1989, Vol. 3, No. 1.

III. Advertising - Why Do We Buy?

Objectives:

Students will:

1. Understand why advertising is used.
2. Determine different types of advertisements and the purpose of each.
3. Distinguish the portions of advertisements that are useful from those that attempt to influence our opinions.
4. Learn how TV advertising affects food purchasing habits.
5. Recognize how much air time is spent on food commercials.

Teacher Background:

Advertising, whether on television and radio or in newspaper and magazine ads, influences what we purchase. Manufacturers would like us to believe that using their products will make us more popular, more attractive, richer, happier and/or more successful. Advertising can influence us to believe it's not just desirable but necessary to have expensive athletic shoes, snowboards, microwave ovens, cordless phones and a thousand other things.

Students need to understand when and how they are being influenced by advertising to make unwise choices. By analyzing various advertisements and looking at the messages behind them, we can learn to sort out fact from fiction. Advertising can be useful. Product packages, labels and messages sometimes provide information about the availability of products and their contents.

Television advertising, because it can integrate images, words and sound, is particularly persuasive and often encourages an emotional response. Take, for example, commercials for restaurants or packaged food products. The food is prepared by professionals especially for the commercial. The message is often implied that eating a particular food will miraculously make you feel a certain way, win you new friends, or make you the "coolest" kid on the block. These commercials offer little useful information -- when was the last time you saw an ad for a fast-food chain that told you a burger, fries and shake will give you more saturated fat than you should have in an entire day?

Student Activities:

1. Survey of Magazine Advertising
    a. Have each student choose two magazines.
    b. Survey the nature and extent of advertising, recording observations on a chart. Make your chart as follows:

Column 1: Name and manufacturer of product
Column 2: Size of each ad
Column 3: Informational content (nutrition, food quality, pricing, etc.)
Column 4: Non-informational content (recipes, coupons, contests, slogans, etc.)
Column 5: Reason to buy (short sentence telling motivation to buy.)

2. What's in an Ad?
    a. Cut out food advertisements from a newspaper or magazine.
    b. Paste onto large index cards.
    c. Use the following classifications to see which elements are used in the advertisement:

Status
Convenience
Taste
Nutrition
Packaging
Color
Humor
Natural Content
Quality
(Plus Your Own Ideas)

You can hold up cards with ads and have students determine out loud what elements are used, or have students paste up ads and indicate elements by writing in the margin and drawing arrows.

3. TV Advertising Survey
   Have students:
   a. Make a chart like this one:

ALL COMMERCIALS			FOOD COMMERCIALS		
#	Duration	Product	#	Duration	Product

   b. Watch television for two hours, recording the number, length and type of commercials.
   c. Using the information they have collected, calculate the following:

      1) Percentage of program time on all commercials;
      2) Percentage of program time for food commercials.

   e. List the foods advertised and number or times they saw each commercial.
   g. Discuss their findings.

4. How Well Does Advertising Work?
   Get the class together and plan a sale. The class could bake cookies and brownies, make toys, cook hot dogs or popcorn, etc.

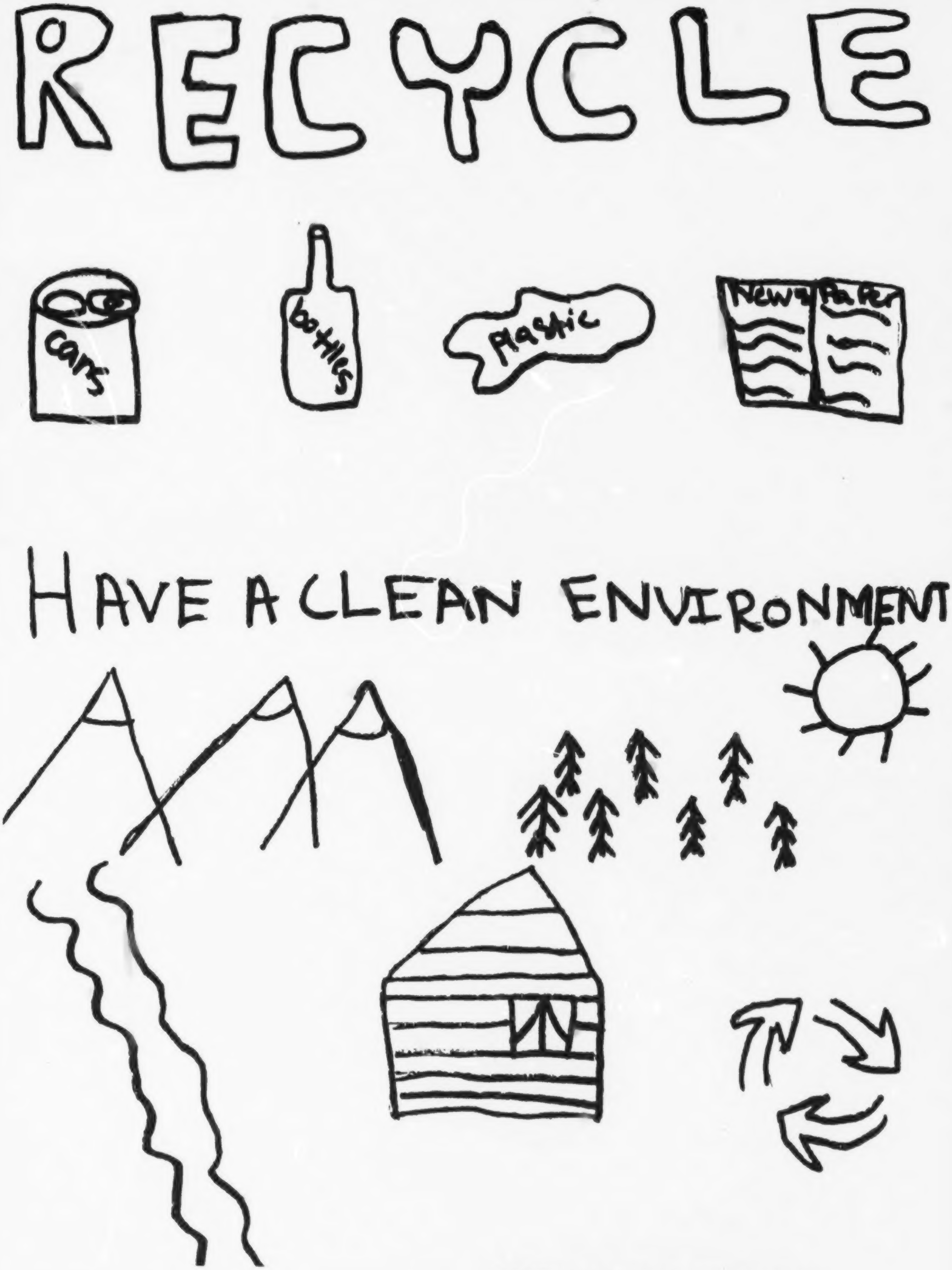
   Limit your sale to an hour. Don't tell anyone about it. Record:
   1) Number of people who came;
   2) Number of items you sold;
   3) Amount of money you made.

   Plan another sale of the same items. This time, tell everyone about it. Students can make posters and put them up around school and town, tell family and friends, hand out flyers -- get the word out.

   Again, limit your sale to an hour and record customers, sales and profits. Compare the two sales. What difference did advertising make?

Discussion Ideas:

1. What is the purpose of advertising? Is advertising necessary? Who pays for it?
2. Why are there so many advertisements in magazines and on TV?
3. Imagine a world without advertising. How would things be different? Would products be more or less expensive? Would there be a greater or lesser variety of products?


RECYCLE
cans
bottles
plastic
News Paper
HAVE A CLEAN ENVIRONMENT

-RAVEN JACKSON, ANGOON AK

UNIT FIVE: REUSE

I. Waste Not, Want Not

Objectives:

Students will:

1. Learn how traditional Native people used all parts of an animal and how they reused many materials.
2. See that we can attempt to fully use our resources just as traditional Natives fully used theirs.

Teacher Background:

Traditional Native peoples used almost everything from the animals they took -- meat, bones, internal organs, sinew, nothing was wasted. All edible parts were consumed, and other parts served as sources of material for clothing, shelter and equipment. Such economy was necessary because most Native people lived in an environment in which resources were scarce. They didn't waste anything because they couldn't afford to; survival depended on using every last bit of every resource.

Our world is different. Even living in remote parts of Alaska, in some of the least densely populated areas on the planet, we have access to a variety and quantity of materials and goods that Native peoples of just a hundred years ago could not even imagine. But what we are gaining in material goods we may be losing in wisdom. We have a wealth of resources, yet we use them inefficiently and in ways that will hurt us further down the road.

Traditional Native people used the same sources of materials for thousands of years. The best techniques for making the most of these resources were handed down through hundreds if not thousands of generations. We are the first few generations to use many, many new materials and products -- we haven't yet learned the most efficient ways to use plastic, steel, gas, oil and other modern "necessities," but we are slowly learning. Perhaps someday we will learn to use our resources as wisely as traditional Native people used the salmon, caribou, whale and other creatures and plants. Then we will have no need for landfills and incinerators.

Our generation can set an example of wise resource use for others to follow by taking some simple steps to reuse products and materials:

- Mend and repair rather than discard and replace.
- Designate places in the kitchen for paper bags, plastic bags, glass jars, plastic containers and other items you can reuse.
- Use cotton rags, napkins and handkerchiefs instead of paper towels, napkins and kleenex.
- Save and reuse envelopes, boxes and packing materials that you receive in the mail. It's especially important to reuse foam "peanuts" or other foam packaging -- these products destroy the ozone layer.
- Save scrap paper and staple it together for scratch pads or use it for rough drafts and math worksheets.
- Buy durable, long-lasting products -- though they are usually higher priced, quality goods last longer and are thus often less expensive in the long run.
- If you're tired of clothes that haven't worn out, have a clothes swap with your friends.
- Share, borrow or rent items you don't use that often.
- Share magazine subscriptions with friends -- when you're all finished, give the magazine to the library or someone else.
- Use a lunch box or reusable bag to carry lunch instead of a paper or plastic bag.

Student Activities:

1. Pick some local game animals. Find live and dressed weight. What parts are used? What parts are not used? Find traditional uses for parts of animals. Investigate percentages of waste. Follow waste. Where does it go?

2. If you are near a fish processing plant or a fish camp, see what is done with the byproducts. What percentage of the fish is usable and what is waste? Compare these percentages with those found for game in activity number one. On average, which yields more food per pound of live weight, fish or game? How much must a moose eat to generate a pound of meat? How much must a salmon eat to do the same?

3. The Closed-Door Experiment
   Try running your class for a week (or two weeks, or a month) without bringing in any materials from outside the room (except food for lunches, if necessary). The longer you choose to run this experiment, the more students will have to reuse materials

and cooperate to make sure that everyone has what they need. Students will be forced to rethink what they put in the trash and whether some waste should be kept because it may prove useful. You may choose to add or take away supplies before starting the experiment.

Discussion Ideas:

1. What would happen if all supplies to your village from outside were cut off today?

2. Why did traditional Native people use their resources so efficiently? What would have happened if they were wasteful?

3. Why doesn't our modern society use materials efficiently? People don't intentionally make decisions that will harm them, but almost all modern cultures have chosen to use resources inefficiently and to harm the environment with unwise agriculture and industrial practices. Why do we choose to hurt ourselves in this way?

II. Some Innovative Ideas

Objectives:

Students will:

1. Learn the value of reusing materials rather than throwing away products or buying new items.
2. Determine why people don't reuse things.
3. Discover several possible ways to reuse materials.

Teacher Background:

Reuse keeps products out of the solid waste stream, reduces natural resource consumption and reduces the need to replace products. Reuse keeps money in the local economy, both in savings and in money paid to local repair businesses.

Reuse may be less convenient than buying new products because time and energy are needed to keep products washed and repaired. Special skills are needed for some types of repair.

However, we can take simple steps to reuse many common items. We can use washable, reusable dinnerware at school, in the office, at home and in local businesses. Use reusable diapers. Buy products using refillable containers when possible. Donate extra paint to the school or whoever can use it. Mend clothes and repair bicycles, 4-wheelers, snow machines or trucks rather than junking them and getting new ones. Give away or sell unwanted furniture, vehicles and equipment. Set up a day or a place where people can give away, exchange or sell things they no longer want.

Our reuse of materials is limited only by the limits of our imagination. In some parts of the country, tires have been used to build the walls of houses by filling them with dirt and then putting a stucco or adobe surface over them. One homeowner in Texas reused a lifetime's supply of aluminum cans by cutting them open, flattening them out, and using them to shingle the outside of his entire house. The cans help keep the house cool by reflecting the sun's heat, and they keep water out, too.

In some cases, trash has even gone "upscale." Some jewelry designers create beautiful objects and help clean up the environment at the same time by incorporating waste into their work. Earrings and rings featuring fragments of beach glass, for example, have become popular.

Student Activities:

1. The Many Lives of a Tin Can
   From used tin cans to:
   - unique lamps (mount socket in bottom of can -- the can becomes a shade)
   - decorative storage containers (cover large tang or coffee cans)
   - pencil/pen holders (paint with acrylic paint)
   - toy telephones (2 cans and some string)
   - school mailboxes (large cans laid on their sides can become instant mailboxes for your classroom)
   - storage containers (for crayons, clay, etc.)

2. Have a contest for the most unique creation using recycled materials.

3. Junk House
   Have the students list substantial items that are commonly discarded (e.g., cars, tires, used lumber, cans, bottles). After you have created an extensive list of materials (visit the dump if your class is short on ideas), ask the students to design houses using only materials from this list.

   When the students finish their drawings, post them up and talk about the designs in a variety of terms: Which design looks most feasible? Which house would you most like to live in? Which design uses materials in the most inventive ways?

Discussion Ideas

1. Ask students to list products that can be used only once (paper and styrofoam plates and cups, paper towels, kleenex, etc.). Then list alternatives (real plates and cups, dish rags, handkerchiefs, etc). Discuss why people choose to use the disposable products rather than their reusable counterparts.

2. Take the idea above a step further by listing products that can be used only for a short time before they wear out or become obsolete (disposable razors, ball point pens, personal computers, even some poorly built vehicles). What are alternatives to using these products? What are some ways we might reuse the materials in these products?

3. Have students list their prized possessions. Ask them to determine how long these things will last -- a year? Five years? Ten years? Why is it that our modern culture, with its incredibly advanced technology, produces so many products that wear out or become obsolete in a matter of a few years?

III. Reusing to Grow: Composting and Gardening

Objectives:

Students will:

1. Learn about composting and mulching.
2. Learn how to maintain a compost pile.
3. Discuss advantages and disadvantages of composting.
4. Learn about crops that can be stored for winter use.

Teacher Background:

Native people have traditionally lived off the land. We can continue this tradition. By growing and harvesting vegetables, cole crops, herbs and flowers, we take steps toward becoming self-sufficient, and help to save our environment, too. Families have found that growing vegetables can reduce their food bills drastically.

Many gardeners and farmers agree that **COMPOSTING** is the key to creating the fertile soil in which plants thrive. Composting is a simple way we can help the environment by reducing solid waste and reusing valuable materials. Composting is a natural bacterial process in which organic waste is converted to fertile soil. Organic waste is any waste from plants or animals, such as weeds from gardens, leftover or spoiled food, pet droppings and animal carcasses. Natural bacteria digest these wastes, and convert them into nutrients which can be used by plants.

Composting has many benefits. It returns nutrients to the soil, and it creates fertile soil for gardening or landscaping. Composting also reduces waste. Waste disposal costs money (see "Cost of Disposal" exercise), so reducing waste by composting can save money.

Potential problems with composting are that food wastes may attract animals, and compost may create odors. These problems can be avoided by keeping meat, bones, grease and dairy products out of the compost pile. These organic wastes can be composted, but they take longer to decompose and are more likely to attract animals. Another option is to build a compost pile that will keep animals out.

Another potential problem to avoid is letting disease spread from a compost pile. When compost piles get warm enough, they will sterilize most wastes. However, diseased plants should not be composted, because the plant disease could survive composting and be spread when you use the compost. Also, compost made from animal droppings should not be used for a vegetable garden, though it could be used for other purposes.

There are two types of composting processes, aerobic (in the presence of oxygen) and anaerobic (without oxygen). Composting is most efficient when the organic waste is damp, warm, and mixed with air. If your area is warm enough to grow a garden, it is warm enough for composting. Alaska has cold temperatures, so composting typically takes longer here.

Anaerobic composting occurs naturally in places where there is a limited supply of air, such as in buried landfills, and in debris at the bottom of lakes. Anaerobic decomposition of organic waste produces methane (natural gas). Methane is **COMBUSTIBLE** (burns) and is explosive, so this gas needs to be either vented or collected to avoid a fire hazard. Anaerobic decomposition can also create smelly hydrogen sulfide gas (the distinctive "rotten egg" smell), and ammonia (the smell of sewage).

Aerobic composting does not create odors. To keep compost aerobic, it must be periodically turned with a shovel or pitchfork. Sufficient moisture is needed to keep the bacteria active, but too much moisture could turn the process anaerobic.

Another option is worm composting. Worms speed the decomposition process. The Cooperative Extension Service may be able to provide starter worms or tell you where you can get them. Compost can simply be piled on the ground. When the pile is first started, worms can be added. After that, the worms will survive freezes and won't need to be replaced, as long as there is food for them.

Composting can be done by individual households or community-wide. Food scraps, plant waste and animal waste can be composted. Meat can be composted, but might stink and attract animals. Fish composts very well. Newspaper, cardboard and other wood fiber can be composted, but inks and other paper treatment chemicals might contain metal (in the printing ink) and dioxin (from the pulp-bleaching process), which make the compost toxic. Plastic does not interfere, but won't compost, either. Composted dog and cat waste can be used for fill or landscaping, but should not be used for soil in vegetable gardens.

Composting can be done in piles, rows, barrels, bins, etc. A variety of composting containers are sold to keep animals out, make turning the pile easier, and even to insulate the compost, and you can make your own also. Some composting "worm bins" are designed for use indoors in the kitchen.

Here are some ideas you and your students might apply to existing village gardens or a garden you start together:

- Save seeds of the plants you like best. Plant them next year.
- Learn which garden plants are natural insect repellents for others -- like marigolds and tomatoes.
- Learn how to maintain a compost pile, and use the compost in your garden so you won't be dependent on commercial fertilizer.
- Utilize fish water when possible for watering your gar den. You are conserving water and fertilizing your garden naturally.
- Plant crops that can be stored for winter use. Share a portion of what you grow with an Elder.
- Give people gifts that help the environment, like garden tools or flower boxes, plant starters, or gardening books.
- Conserve water by mulching your plants. Always use warm water, as cold water will reduce vegetable yields due to added stress on plants.

Student Activities:

Start a class garden and compost pile. As noted in the text above, if it's warm enough in your area to grow flowers and vegetables, it's warm enough to compost. In the winter you may be able to compost indoors or in semi-insulated spaces (garages, sheds, etc.)

Use The Compost Heap in Alaska, available from the Cooperative Extension Service, as a guide.

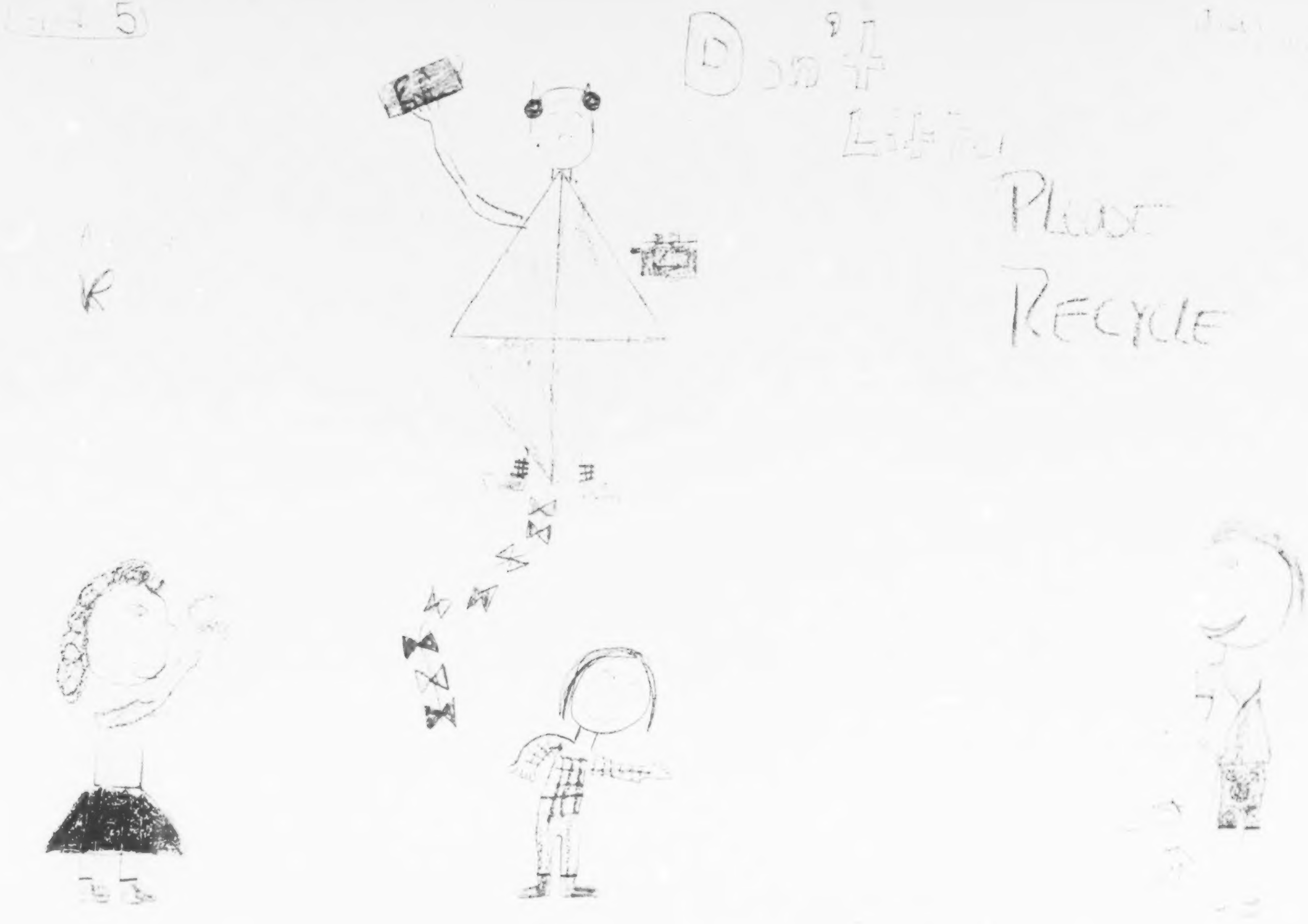
Discussion Ideas:

1. What do you need to start a compost pile? Are some of those elements (e.g., moderate temperature) hard to come by in Alaska? How can you get around the inherent problems of composting in a cold environment?

2. Would it be possible for everyone to compost all of their organic wastes? What problems might this present? (This is a good chance to talk about the density of urban population as contrasted with that of rural or remote populations.)

Resources:

1. The Compost Heap in Alaska. Cooperative Extension Service, #300G-1-022.

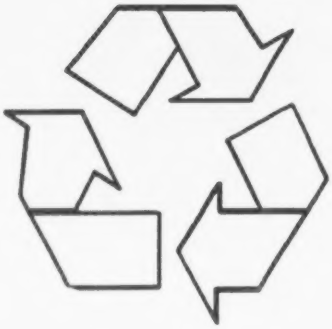


Don't
Litter
Please
Recycle

-JULIA WHOLECHEESE, 5TH GRADE, ALLAKAKET AK

UNIT SIX: RECYCLE

I. What is Recycling?



Objectives:

Students will:
1. Learn why it is important to recycle as much as possible.
2. Determine resources that can be recycled.
3. Learn the steps involved in recycling glass, paper, aluminum, cardboard and used oil.

Teacher Background:

To **RECYCLE** is to do or use over and over again. Source reduction is preferable to recycling because it eliminates the waste altogether; however, some wastes will continue to be produced, and many of these can be reused or recycled. Recall when the class kept track of the types of wastes that were made by saving the classroom trash for a period of time (see activity in the Reduction chapter). What quantity of those wastes would be recyclable?

In order to recycle any waste, it must be separated. If you buy eggs, cookies, milk and salt at the store, would the food be useable if the store clerk mixed it all together at the check-out stand? The same principle applies to recycling wastes -- materials are not useable when they are mixed in with all of the other garbage.

Recyclables include glass, paper, aluminum, cardboard and engine oil. Learning a bit about what these products are made of, how they are made and how they can be recycled will help us understand how recycling saves energy and resources.

Glass is made from soda ash, sand and lime. To be recycled, it must first be sorted by color and crushed into small pieces called cullet. The cullet is melted down into a liquid and then molded into glass containers. Other products using recycled glass include road-construction materials and insulations. Making recycled glass uses half the energy required to make new glass[14]. It also saves resources in other ways, for example by eliminating wastes and environmental damage created by obtaining raw materials.

Paper is made from wood pulp -- shredded trees mixed with water and chemicals. Paper is recycled by first shredding it into small pieces and mixing it with water. This mixture is beaten into a mush-like pulp which flows onto a moving screen through which most of the water passes. The wood or paper fibers remain. The fibers are pressed through heavy rollers to remove more water and then are dried. To make newspaper from used newsprint instead of virgin wood uses 60% less water, results in 70% fewer air pollutants (from the pulp mills), and uses 25% to 50% less energy. Recycling newspaper also saves the forest resource, since it takes 17 trees to create one ton of newspapers, which is the equivalent of 67 foot-high bundles. It takes more than 80,000 trees to produce one Sunday's run of the New York Times[15].

About 50% of the waste made in Anchorage is paper[16]. The Anchorage Recycling Center processes about 3,000 tons of paper a year[17].

Aluminum is made from an ore called bauxite. Mining bauxite requires heavy equipment and can result in environmental damage. Production of aluminum requires a tremendous amount of energy -- this is why aluminum plants are often located near inexpensive sources of electricity, for example, near the hydroelectric dams of the Columbia River. Recycling aluminum is relatively simple -- the recycled materials are melted down and then shaped anew. To make aluminum cans from old cans takes only five percent as much electricity as making cans from the ore[18].

The simplest way to recycle a cardboard box is to use it again. Cardboard can also be recycled in much the same way as paper, as long as it's the corrugated kind (without wax, and not including the "pressboard" type, such as is used for kleenex or cracker boxes).

Used oils (also called "waste oils") are lubricating transmission, hydraulic and engine oils which have deteriorated or been contaminated so they no longer are able to perform their original function. Used motor oil can be collected and recycled safely and effectively. It can either be cleaned and used as fuel to be burned in specially designed facilities, or it can be refined and used again as motor oil.

Student Activities:

1. Bring in a trash can filled with various materials. Measure the weight and volume of the garbage. Decide which types of waste can be recycled and which cannot. What percentage of the trash was recyclable, by weight and by volume?

2. Find out what types of products are recycled in your village.

3. If possible, set up a recycling program in your school or village. (See Resource List at the end of the curriculum for assistance in setting up a program.)

Discussion Ideas:

1. Why has recycling become more common in recent years? What factors have contributed to making recycling viable on a large scale?

2. Why do Americans now recycle much or almost all of some materials (glass, aluminum) and almost none of others (plastic)?

3. What steps can we take at home or at school to recycle more materials?

II. Problems With Recycling

Objectives:

Students will:

1. Learn about the limitations and costs of recycling, particularly in rural Alaska.

Teacher Background:

While recycling is the best option for waste not eliminated by source reduction, it does have its drawbacks, particularly in rural Alaska. Not all solid waste can be recycled, and recycling creates costs as well as savings. For example, creating paper from used paper doesn't generate as much pollution, but it still is a polluting process. And to transport the used paper to the recycling mill uses fuel and causes transportation-related pollution (air pollution from exhaust, pollution made during the manufacture and maintenance of cars, trucks, planes, boats.) To reprocess materials often requires intermediate steps, such as washing, crushing and heating, and all of these can create wastes and/or use energy, too.

In rural Alaska, there are few recycling systems in place. Even with the difficulty of transporting recyclables away from villages, we stand to gain from recycling more and dumping less. The problem here is that the true payment for used materials includes items that are difficult to track. The savings of having less garbage going to the landfill is a true savings to the community, but no one actually exchanges dollars for this. Laws to encourage or require the purchase and use of products made of recycled materials, such as office paper and newspaper, are being passed in many states. Eventually these may force changes in our economic system that will result in higher prices for reusable materials.

For villages in Alaska, the "Flying Cans" program can offer a start for recycling aluminum cans. Airlines that are members of the National Air Carriers Association have agreed to carry aluminum cans to Anchorage without charge on a space-available basis. In Anchorage, the Anchorage Recycling Center will pick up the shipments, repackage and ship to recycling plants.

At Ipalook Elementary School, one sixth grade class initiated an aluminum can recycling program by placing large cardboard boxes, labeled for recycling, in strategic community locations (government offices, airport). In the first month, they were surprised at the quantity they collected, almost 300 pounds. The class realized quickly that they needed to get a can crusher, because they didn't have enough storage space. The students learned that the community was quick to respond and cooperate with their program. Without advertising, they soon had boxes of cans delivered to the school in addition to filling the collection boxes that the kids made.

Student Activities:

1. Have students interview three different people to get their opinions about recycling. From this, make a list of currently existing barriers to recycling. What can be done to overcome these barriers?

2. Contact a local representative familiar with recycling. Have them explain the costs and processes involved.

3. Contact a school or village in rural Alaska that successfully recycles waste. Find out what makes their program work.

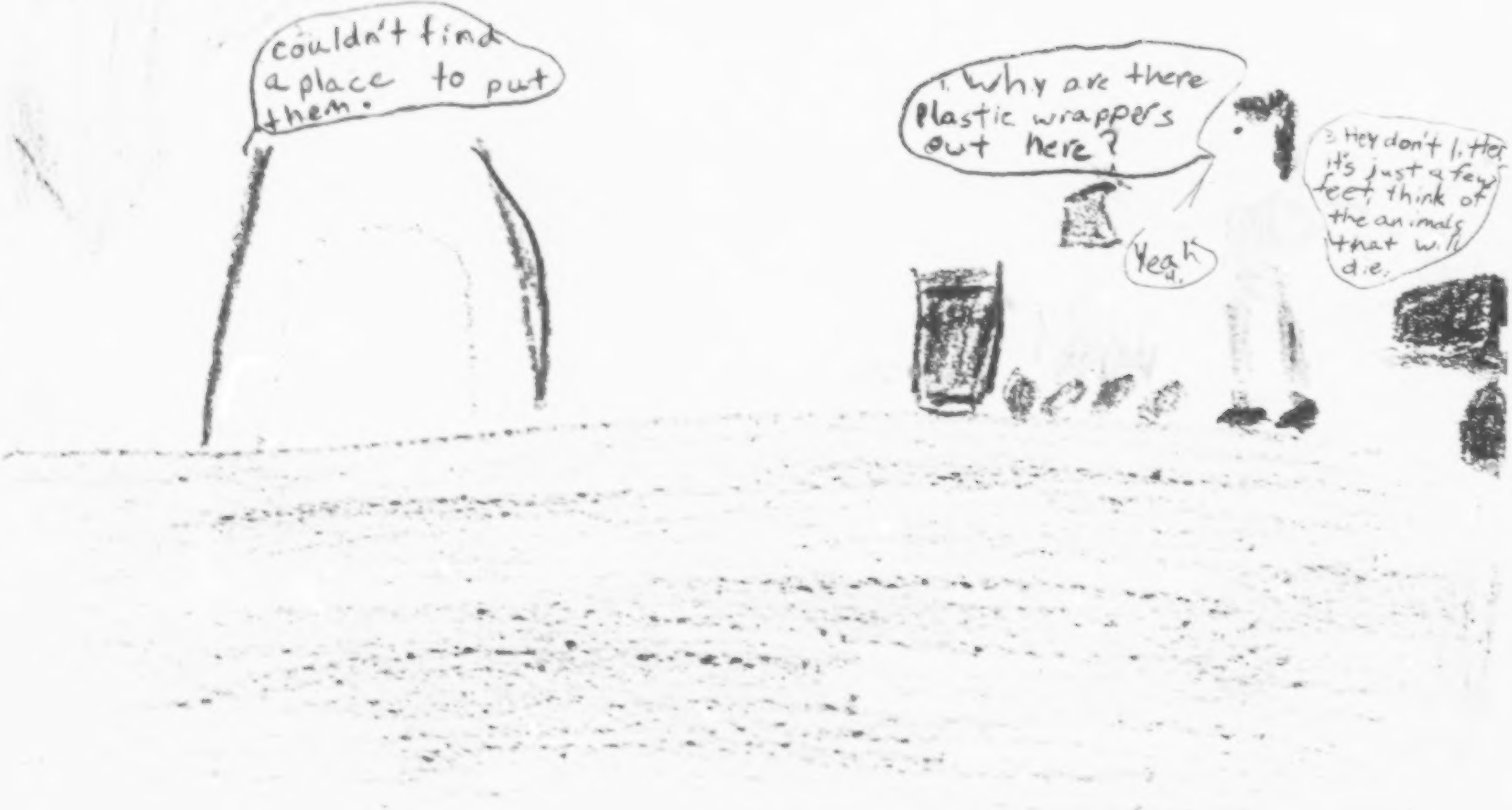
Discussion Ideas:

1. Even in areas with good recycling services, people still often throw recyclable items in the trash. Why is this so?

2. Can you imagine a world in which we recycle or reuse everything? What would be the toughest items to recycle or reuse? Can you think of anything that is absolutely not recyclable or reusable?

Resources:

1. Anchorage Recycling Center, 6161 Rosewood Street, Anchorage, AK 99518 phone (800) 478-2267 produces a "CAN-DO" kit to assist children in beginning their own aluminum can recycling program. The kit includes educational materials, instructions, tags to label the bags of cans (so the kids can receive payment per the weight of the bags.)
2. Alaskans for Litter Prevention and Recycling (ALPAR) P.O Box 200393, Anchorage, AK 99520 phone 274-3266. Has information, flyers about litter prevention and recycling, and can provide strong plastic bags for collecting litter or aluminum cans in.


couldn't find a place to put them.
1. why are there plastic wrappers out here?
3. Hey don't litter it's just a few feet, think of the animals that will die.
Yeah 4.

-TRAVIS SEE, 7TH GRADE, ANGOON AK

BEST COPY AVAILABLE

UNIT SEVEN: DISPOSAL

I. Biodegradable Waste: Natural Decomposition Cycles

Objectives:

Students will:

1. Learn key terms, including: organic, inorganic, decomposed and biodegradable.
2. Determine how the following materials biodegrade differently: glass, aluminum, plastic, steel, fruit and vegetable.
3. Gain understanding of natural decomposition cycles.

Teacher Background:

Natural decomposition cycles eliminate waste entirely because all matter is transformed into other usable matter. **ORGANIC** waste is **BIODEGRADABLE**, that is, when exposed to adequate amounts of warmth, sunlight, air, water and/or soil, it breaks down into other usable matter. When the cycle is overloaded (too many species in too small an area) all organic waste cannot be **DECOMPOSED** into usable matter. **INORGANIC** waste, or waste that has never been part of a living organism, can also accumulate and become toxic. Metals, minerals and ores are possible examples. Synthetic chemicals such as plastics, paints, drugs and pesticides are the least likely to disintegrate and may not biodegrade for generations.

A decomposition cycle consists of various processes that transform one type of material into another. For example, a tree grows in soil. One leaf falls to the ground and is partially decomposed by fungi and bacteria. Some of the chemicals directly leach into the soil, enriching it. Further decomposition occurs via earthworms, bacteria, soil, mites and fungi, ultimately resulting in organically rich soil. This, in turn, provides nutrients for the tree.

Different substances biodegrade, or decompose, at different rates. Decomposition times depend on temperature, sunlight and moisture. In some regions of the United States, banana peels can take up to 6 months; wooden stakes, 4 years; wax paper cups, 5 years to decompose; and glass never decomposes, (note that these times are for lower 48 conditions and would be much longer in Alaska because of colder temperatures).

Student Activities:

1. How Long Until It's Gone? (Experiment lasts 6-8 weeks)
   Materials: five pieces each of glass, aluminum, paper, plastic or "biodegradable" plastic, steel, apple or other fruit, lettuce or other vegetable, orange peel. If lettuce and apples are difficult to obtain, try locally grown potatoes and/or peelings, fish bones or local edible vegetation (rhubarb, seaweed, kelp, wild onions, edible leaves, etc.).

   Procedure: Display the materials. Ask the class to predict which substances are capable of rotting or decomposing and how quickly each will biodegrade. Record these predictions. Explain the experiment below and ask the students to choose, as a class, one more material to add.

   Dig enough soil from outside to fill five containers. (One-pound cottage cheese containers would be suitable.) If soil is unavailable when you are ready to do this experiment, ask someone who has a greenhouse for a small amount of soil. If all else fails, use potting soil. Collect five pieces of each of the substances originally displayed and bury one piece of each substance in each container. Number the containers from 1 to 5. Leave container 5 outside, to be collected next spring (or if you begin the exercise before the ground is frozen, bury the samples in the ground and mark it, so it can examined once the ground is thawed.) Keep the remaining four containers inside. Examine container 1 after two weeks, container 2 after four weeks and so on. Each time a container's contents are examined, have the class record observations on the condition of each of the different substances.

   As the experiment proceeds and when it has concluded, check the results against the class's original predictions of how biodegradable each material would be.

2. Mold Garden
   Materials: container, small pieces of fruit, bread or cheese, small amount of moist soil, clear plastic, rubber band.

   Procedure: Place very small pieces of fruit, bread and cheese on top of some moist soil in a container. Cover with the clear plastic and rubber band. Observe the changes over a day, a week, a month.

   Ask the children if they know what is growing on the food. Explain to them that these are molds and that they help return minerals and nutrients to the soil by feeding on the food.

3. Decomposition
   Materials: dead leaves or grass in varying stages of decomposition, 3 x 5 cards, string.

Collect dead vegetation in several stages of breakdown. Ask the students if they know what becomes of all the leaves or grass that are on the ground in the fall. Where have they gone the following summer?

Make the connection that vegetation becomes soil by letting the children see and feel the layers of organic matter (decomposing vegetation) that you collected.

Make a large art project showing the cycle of vegetation. The illustration should show how a plant's leaves fall, decay into the soil, nourish the plants by making the soil richer, and thus help the plants to grow and produce more leaves. Leaves will decompose very slowly in the arctic and subarctic regions of the state, but decomposition is still an important process that adds nutrient-rich organic matter to mineral soils.

4. Another way to illustrate growth and decomposition cycles would be to print the following words on 3 x 5 cards: soil, buds, roots, green leaves, stems, dead leaves, branches. Distribute the seven cards to seven children at random. After each child has shown her or his card to the class, give a long piece of string to the child holding the card marked "soil." Ask the children to arrange themselves in the proper order of growth. As each determines its corresponding position, he or she should take hold of the string. They should end up in a circle.

5. Further explore composting by recycling kitchen garbage into something useful. Crushed egg shells, coffee grounds, fruit and vegetable peels can be saved and added to the garden compost pile in the spring.

   Old timers used to water their gardens with water that was used to wash fish. This was their way of adding fertilizer to the soil without using harmful chemicals.

Discussion Ideas:

1. Most decomposers (yeast, mold, bacteria) are too small to see with the naked eye. What would tell you that decomposers are at work? Where would you find the end products of their work?

2. What do you think makes decomposers work: a) faster; b) slower?

3. Stress the similarity of molds and their actions on organic materials to lichens and mosses in the northern and high altitude areas of Alaska. The acids produced by lichens and mosses break down plant material and even rock into small bits of soil that is then able to support higher plants.

4. A major problem with litter in Alaska is the extremely slow decomposition time for biodegradable materials. Whatever is dropped to the ground (litter) in Alaska does not decompose quickly and is likely to be an eyesore or pollutant until it is picked up. Have the students list prominent examples of this problem in their village. What are some possible solutions to this problem? How could biodegradation be hastened?

5. Long ago our Elders learned the nature of mold, and how it would break down or destroy their supply of food if food was not properly taken care of.

   Name some ways people preserved their food to prevent molding or spoilage. (For example: hanging meat to provide circulation of air, smoking and drying meat over a low fire, digging holes in permafrost ground to chill or freeze food.) How do we prevent decomposition of our food today?

II. Digging In: Looking at How Our Community Disposes of Solid Waste

Objectives:

Students will:

1. Compare the amount of waste Americans produce with the amount produced in other countries; compare the amount Alaskans produce with the amount other Americans produce.
2. Determine if people are producing more or less trash than they did in the recent past.
3. Learn the relative amounts of trash burned, recycled or put into landfills.

Teacher Background:

With only five percent of the world's population, the United States uses 25 percent of Earth's resources and generates 30 percent of its garbage. Each American throws away an average of at least 3.5 pounds of garbage per day, a total of more than 150 million tons a year. The amount of trash generated by Americans grew 60 percent between 1960 and 1986, and some critics predict that the amount of trash discarded per person will grow to more than six pounds per day by the turn of the century. Alaskans already dispose of an average of six pounds of trash per person per day.

In the U.S., about 5 percent of our trash is recycled and another 10 percent is burned in incinerators. The bulk goes into an estimated 6,000 landfills around the country. Unfortunately, these landfills are filling up at a rate of 600 per year, almost faster than we can build new ones[19].

Student Activity:

1. The History of Trash in Your Village

Talk to Elders from your community about how they disposed of their trash long ago.

Ask the Elders to estimate how much trash each person generated per day (or week), and compare that to present day practices.

Prepare a timeline showing your village's waste disposal history. Things to note on your timeline: how trash was disposed of at different times; where, when and why dump sites were established or closed; when collection services started; number of persons employed in waste disposal at different times; when and why recycling programs began, etc.

Post the timeline in a public place and promote the three R's: reduce, recycle and reuse.

Taking this project one step further, approach your local government and ask them what is being planned for future solid waste disposal.

Discussion Idea:

Brainstorm local solid waste concerns. Some ideas include: waste oil, snow machine frames, window frames, electricity usage, fish processing wastes, mining, logging or industry wastes, etc.

Where do these wastes come from? Why does our community accept them? Where are they disposed of, and who pays for disposal?

IV. Waste Incineration: Pros and Cons

Objectives:

Students will:

1. Learn about the advantages and disadvantages of incineration.
2. Understand the requirements for safely burning waste.
3. Discuss why a village would or would not want to incinerate its trash.

Teacher Background:

INCINERATION (burning) of waste is not common in villages. However, given the ever-growing problems we face in disposing of trash in remote areas where landfills are problematic, we must consider all options.

Benefits of incineration include:

- sterilizes waste
- reduces waste bulk by 80 to 90%
- enables recovery of an otherwise wasted resource (as heat)
- eliminates the organic content of waste, which reduces wildlife attraction and bacterial decomposition within the landfill. Reducing bacterial decomposition reduces gas generated in the landfill and landfill subsidence.

Drawbacks of incineration include:

- creates air pollution
- requires disposal of ash, which is often toxic
- discourages source reduction and recycling if incinerator is too large, which many are
- requires buying and maintaining expensive facilities and equipment
- requires separation of waste before incineration

Efficient and safe incineration requires that waste be sorted so that only appropriate **COMBUSTIBLE** waste is burned. Careful sorting can minimize the creation of toxic ash. For example, batteries (lead-acid or household) and other metals should not be incinerated because the non-combustible heavy metals in these items create toxic ash. In addition, some of the toxic metals will escape to the air in the exhaust gas. Glass can melt but won't burn, and it interferes with incineration if present in too high a concentration. Flammable and explosive materials can cause explosions or fires which might threaten the safety of operators and damage the facility.

III. The Garbage Industry: A Billion Dollar Business

Objectives:

Students will:

1. Learn about major problems with landfills/dumps.
2. Learn about methods of reducing these problems.

Teacher Background:

Given the figures quoted in the previous section on the huge amount of trash that Americans produce, it shouldn't be surprising that garbage disposal is a fast-growing and profitable industry. In the lower 48 states garbage companies are battling for control of regions' garbage disposal contracts. Landfills are filling up at an alarming rate, and new federal and state regulations will force older community garbage dumps to close and may spur development of bigger, regional landfills to meet environmental regulations and capacity needs.

Although many of our smaller towns and cities are not faced with the same volume of waste as big cities are, we have our own acute waste disposal problems. Rural American communities, both in Alaska and the lower 48, often lack the expertise and funds to properly dispose of waste. In addition, recycling efforts in rural communities are crippled by the difficulty of transporting materials long distances to recycling centers.

Disposal problems vary across Alaska. Some problems with dumps/landfills include: unattractive land usage; unwanted attraction of wildlife or rats; the high cost of proper operation; need for working heavy equipment to cover the trash frequently; lack of confinement (no fence); flooding from the ocean, rivers or high water table; poor location; permafrost; lack of cover materials; and a lack of a solid waste plan that takes into account future generations.

Perhaps lessons learned in environmental education can have a positive impact on getting even the smallest villages to address ways to dispose of their garbage in an environmentally safe way -- before we have miles of trash strewn across our countryside.

By promoting changes in our consumerism, reducing, recycling and reusing, we can have a positive impact on our communities and help save our land for future generations.

Student Activities:

1. Fill 'er Up

   Students will figure out how soon the village's solid waste would fill a recognizable building, for example, a gymnasium, community hall or school. This activity takes a bit of math and science work. Students will need to find out:

   - the population of your village
   - the volume (in cubic feet) of a structure
   - the average amount of trash produced daily by each Alaskan (which we know from an earlier chapter to be about 6 pounds)

   These tasks completed, there is one final problem: the figure we have for an Alaskan's daily garbage output is in pounds, and we need a figure in cubic feet. To convert the 6 pound average, students must determine a ratio between weight and volume, which they can do by measuring both the weight and volume of a number of trash samples and then computing an average. With this ratio computed, all that's left is to multiply the population by the daily production (in volume).

2. Visit your village's dump or landfill. Have the students assess the site in terms of its total environmental impact. Does the site "uglify" an otherwise beautiful landscape? Do odors from the dump pervade the village on warm summer days? Are wastes from the dump leaking into streams, rivers, lakes or bays? Is the dump an unhealthy attractor of wildlife? What measures might be taken to fix problems with the village's dump or landfill?

Discussion Ideas:

1. What are some of the problems associated with landfills? What are special problems with landfills in Alaska or in other cold and/or remote places?

2. Historically, people all over the planet have disposed of garbage by putting it out of sight, which has usually meant putting trash on or in the ground in a place away from where people live. This worked fine when there were fewer people on Earth and those people produced very little trash, almost none of which was toxic. But things are not what they used to be -- world population in 1990 was about 5.3 billion, more than twice the population in 1950. All of these people are consuming more and generating more waste than any humans ever have before. What are we going to do with all that trash? Bury it? We obviously can't keep doing what we've been doing, but what are the best alternatives?

Student Activities:

1. Imitation Incinerator
   The purpose of this activity is to see first hand what incineration does to trash -- how it affects the volume and consistency of waste.

   Collect a bag of trash. Exclude items that would be too toxic or dangerous to burn (e.g., plastic, aerosol cans). Weigh the trash and find its volume.

   Burn the bag of trash in an outdoor fire pit. Make sure you have a hot fire going before putting on the trash. While trash is burning, students can make detailed observations of color, volume and smell of smoke; what items appear to burn more readily than others; impressions on what items seem to be emitting dangerous smoke.

   When the fire has burned out, pick through the residue to discover what has not burned. Discuss temperature levels and how they might effect what burns and what doesn't. How hot was the center of your fire? How hot is an incinerator?

   It will be difficult to separate the ash from the wood you've built your fire with from the ash created by burning the trash, but try to make some estimates about how much the volume and weight of the trash were reduced by incineration.

2. Research what types of waste can be burned safely, and what types produce hazardous ash or gas. How does this "book learning" correlate to what students observed in activity 1?

Discussion Ideas:

1. What would be the advantages of burning your village's waste? What would be the disadvantages? Where would you locate an incinerator in your village? Which people and businesses would be in favor of incineration and which would oppose?

2. Incineration reduces the volume of waste -- does that volume just disappear? Where does all of the "disappearing" trash go?

V. Costs of Disposal

Objectives:

Students will:

1. Learn the nine costs of disposal and describe what each entails.
2. Discover who pays the costs of disposal.

Teacher Background:

The first cost of disposal is that we usually paid something for the products we later throw away. Did we need these products in the first place? If so, do they still have any use? Could we have gotten a different product that would have lasted longer or been reused? Could they be repaired, or reused for some other purpose?

Even if the waste we throw away did not cost us anything to start with, it will cost us something to throw it away. This is true regardless of whether or not our city or village charges us a fee. Many communities only charge a small fee for waste disposal, but then they charge higher taxes to help pay for waste disposal. Even if a community doesn't manage solid waste now, it may still cost money down the road if a pollution problem is created which hurts the economy or requires expensive cleanup. Different costs for throwing things away are listed below.

Transportation: The cost of transporting the waste to the disposal site. Whether we bring waste to the disposal site or a community garbage service picks it up for us, it costs money to buy, maintain and operate the vehicles for transporting the waste.

Land: Land has a value. Although we do not buy the land that we utilize in most villages, the land has potential monetary value. There may be more profitable uses for land than disposing of waste, and we lose that value when we turn such land into a landfill.

Time: It takes people's time to plan and run a community waste disposal site. Unless someone takes the time to maintain the site, it will become an eyesore, fire hazard, health threat and a nuisance. If someone is hired to maintain and operate the disposal site, it will also take community time to oversee that person. Even if waste is shipped out of the community, it will still take someone's time to work out the shipping arrangements.

Equipment: If any equipment is used for transportation, maintaining the disposal site or treating the waste (such as burning or baling), that equipment will cost money to purchase, operate and maintain.

Facilities: Incinerators, landfills, transfer stations and other facilities all cost money for planning, design and construction.

Environmental Monitoring: Air and water quality monitoring are often required for disposal facilities. The amount and frequency of monitoring vary depending on the facility. This can be very costly, but is also important to ensure protection of the community, the land and the water.

Closure: When a facility, especially a landfill, is closed, there are specific practices which must be followed to make sure that the facility does not create any future pollution problems. For example, a landfill must be covered and maintained. Ongoing maintenance can be required for 10 to 30 or more years.

Liability: If the waste disposal creates a pollution problem, there will be cleanup costs. Pollution cleanup can be very costly, especially if groundwater is polluted, as cleanup of groundwater is very difficult. Careful location and design can minimize the risks, but cannot eliminate them entirely.

Opposition: In many communities, people oppose the location of waste disposal sites near their homes because they don't want to live near a waste disposal site. Facing this kind of opposition can be costly, both in time lost and in legal fees.

Student Activities:

1. Find out how much your village spends per year on waste disposal. If a village administrator or the waste disposal contractor is willing, you may even be able to break down the total cost into the nine components listed above.

2. Find out who is responsible for waste disposal in your village. A contractor? The village administrators? County? State? If something goes wrong (toxic waste, bear problem) at your village's dump or landfill, who is ultimately responsible?

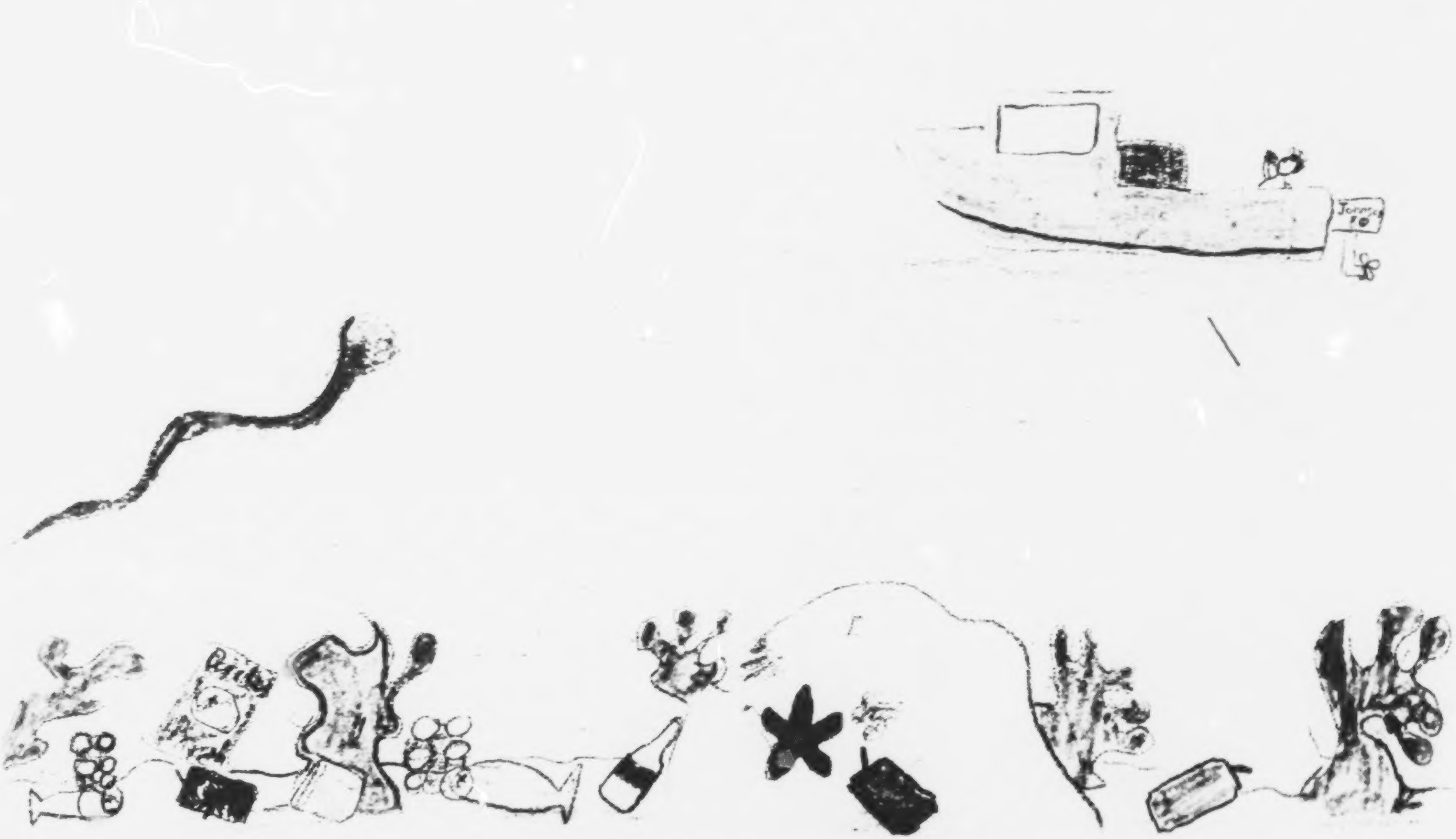
Discussion Ideas:

1. Who pays for garbage disposal in your village? If residents pay a collection fee, does this fee cover the total cost of disposal or just part of the cost?

2. Are there hidden costs of disposal in your village (e.g., toxic leaks from landfill that create costly damage)? Is it possible to anticipate all the possible costs of waste disposal? Do you think that people who created landfills 20 or 40 years ago anticipated common problems that now seem obvious, such as eventual leakage of hazardous waste into surface and ground water?

3. Consider this hypothetical situation: A 30 year-old landfill in a village is found to be leaking toxic sludge into a nearby river. Salmon runs and spawning rates are declining because of this waste. The state now operates the landfill, but for its first 20 years it was run by someone else hired by the state. The company that used to run the landfill also designed and built it. Who is responsible for cleaning up the waste and reviving the salmon run? What if the company that built and operated the landfill has gone out of business? Everyone in the village pays the price, but who's at fault?

Please keep our waters + lands clean.



-DAVID JOHNSON, 7TH GRADE, ANGOON AK

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UNIT EIGHT: BACK TO THE FUTURE

I. Think Globally, Act Locally

A. Connections

Objectives:

Students will:

1. Learn how products used locally can deplete natural resources and produce wastes in other regions.
2. Discuss how each person's actions directly affect the health of the environment.

Teacher Background:

"Thinking globally, acting locally, we can save the earth."

Save the Earth, Betty Miles, 1991

Thinking globally means being aware of the Earth's big problems -- understanding how they are connected, that they're influenced by forces like politics and population and poverty, and that no matter where they occur, they can affect everyone on Earth.

Thinking globally is like looking at a whole forest and seeing beyond the beauty of the trees. It means thinking about the forest's history, its wildlife, the resources it provides and the people it supports. When you think globally, you think about the forest's effect on the climate around it, about over-logging, acid rain and soil erosion. You think about world-wide action to preserve forests and provide jobs for people who depend on them for a living. That is taking a global view.

When you start thinking globally, it's easier to see how acting locally fits in. Acting locally is planting one small tree, and caring for it, and then planting another one. It's getting a friend to plant a tree, too -- maybe getting everyone in your town to plant trees. Acting locally means doing what you can, where you are, to help the environment.

Student Activities:

1. Where Does it Come From?
   This activity helps students understand that depletion of resources is a worldwide problem. Products used locally use resources and produce wastes in other regions.

The idea behind this exercise is to discover where the various parts of a product come from, where they are assembled and how and where the materials and final product were transported. This exercise works with any product, but food products probably make the easiest and most interesting case studies.

Students can work individually or in small groups. This is basically a detective game, and should be fun for students of all ages. Students first need to figure out all the steps and materials that went into making the product they have chosen. Let's say a student has chosen to investigate a box of cereal. What does it take to make a box of cereal and get it to the consumer? A box of cereal seems like such a simple item, but when they get into it, students will be staggered by the complexity. Trying to figure out where all the ingredients came from, where the materials for the packaging came from and how these materials were gathered in one place is mind boggling.

The best source of information for this exercise will be the manufacturers themselves. Students can write letters to manufacturers explaining what they're doing and what they need to know. Most products have an address right on the package, and most companies are extremely cooperative in providing information, especially for student projects.

Discussion Ideas:

1. Discuss with your students how their lives depend on and affect resources and people in many places. A fun way to do this would be to work through the activities of the day. From putting on clothes in the morning (Who made these boots? Where did the rubber and leather to make them come from?) to getting in bed at night (Where is this alarm clock from? How did it get to this village?), we depend on people and resources from all over the world. Students will see that their lives in a remote village are connected to people and places from Anchorage to Australia to the Amazon.

   Taking this idea a step further, discuss the effects of changes in other parts of the world on life in your village. How does a change in the price of petroleum affect village life? Also talk about how changes in Alaska affect the rest of the country and world. If a geologist issued a report saying that North Slope oil fields will dry up in five years, what effect would that have? How are the prices of salmon and other fish affected by availability?

B. What Can I Do?

Objectives:

Students will:

1. Learn about different types of occupations that involve environmental concerns.
2. Discuss how traditional Native ways might be applicable in the present day.
3. Determine ways they can be involved in the community to help the environment by reducing solid waste.

Teacher Background:

Saving the Earth takes commitment, both from volunteer workers and from those who are making careers in environmental professions. Many people now make their living at jobs that improve the environment. They're scientists, writers, farmers, businessmen, teachers, architects, engineers, designers and government workers, to name just a few.

In the future, there will be even more opportunities for careers in the environmental field. Industries such as logging, defense and oil exploration may cut back on the number of workers they employ, but there will be many new jobs in community planning, alternative energy and other related fields.

If students are interested in an environmental career, they can begin to plan for it right now. Encourage them to start to find out about jobs by asking people who work in the area about what they do. Find out when environmental experts from outside are coming to your village and invite them to speak to your class.

If students decide they want to work for the environment, it's never too early to start. Any work that they do, whether they're paid for it or not, is good experience.

The generation of students you are teaching has the opportunity to turn their world around, to undo much of the damage inflicted during the first few generations of modern living in rural Alaska. Your students can discover ways to apply the wisdom of their Elders, the time-honored ways of their culture, in the context of modern technology. Make them aware of this opportunity and of the responsibility they have for ensuring that future generations will enjoy the natural resources and cultural strengths of their place and people.

Student Activities:

1. List occupations in which people work toward improving the environment. Which are appealing, and why?

2. Interview people that work in environmental careers in your area, if possible, or set up a telephone interview. Write questions to ask people before you interview them. For example:
    - Where are you from?
    - How long have you worked for this cause or organization?
    - What's the most interesting or challenging aspect of your work?
    - What do you like best about your job?
    - What environmental concerns do you have about the area you work in?
    - What can we do to ensure that our land remains undamaged?
    - How did you become a professional in this field? What can I do to do what you do?
    - Do you know of any programs available for students to do volunteer work in conservation/environmental education?

    People the class might consider interviewing include: village or regional sanitarian, wildlife biologist (U.S. Fish and Wildlife Service, Alaska Department of Fish and Game), fisheries biologist, environmental inspector (Alaska Department of Environmental Conservation), energy conservation specialist (Alaska Department of Community and Regional Affairs, Alaska Energy Authority), chemist, botanist, park ranger, landfill or sewage treatment plant operator, environmental activist, land planner.

    Students can write summaries of interviews for the school paper.

3. Teaching the Community Through a Public Service Announcement (PSA)

    Public Service Announcements (PSAs) are noncommercial, nonprofit announcements deemed important to public health and safety and community service. They are aired free of charge by all public broadcasting systems and also on some private, for-profit systems.

    Writing, performing and producing a PSA is a fun way for you and your students to help inform the community about a solid waste issue. Students will enjoy performing the spots and hearing themselves on the radio or seeing themselves on TV, and the community will be more apt to listen to its daughters and sons than to a PSA produced on the outside. Public broadcasting systems, whether local or regional, will air PSA's for free, and many public radio and TV stations will help you produce your piece.

Before you are ready to record a PSA, you and the students need to:

- a. Decide on a solid waste management topic or issue you want to address.
- b. Come up with a message about that issue that you can communicate in a minute or less (PSA's are usually 30 or 60 seconds long -- find out what length your local station is most interested in).
- c. Brainstorm creative ways to convey your message.
- d. Write a script, prepare props, costumes, music, etc.
- e. Rehearse with a video camera or cassette recorder.

When you can skillfully deliver your performance in the required amount of time, you are ready to produce your PSA.

- Consider entering the PSA into the competition for school awards from the Alaska Department of Environmental Conservation (see resource list).

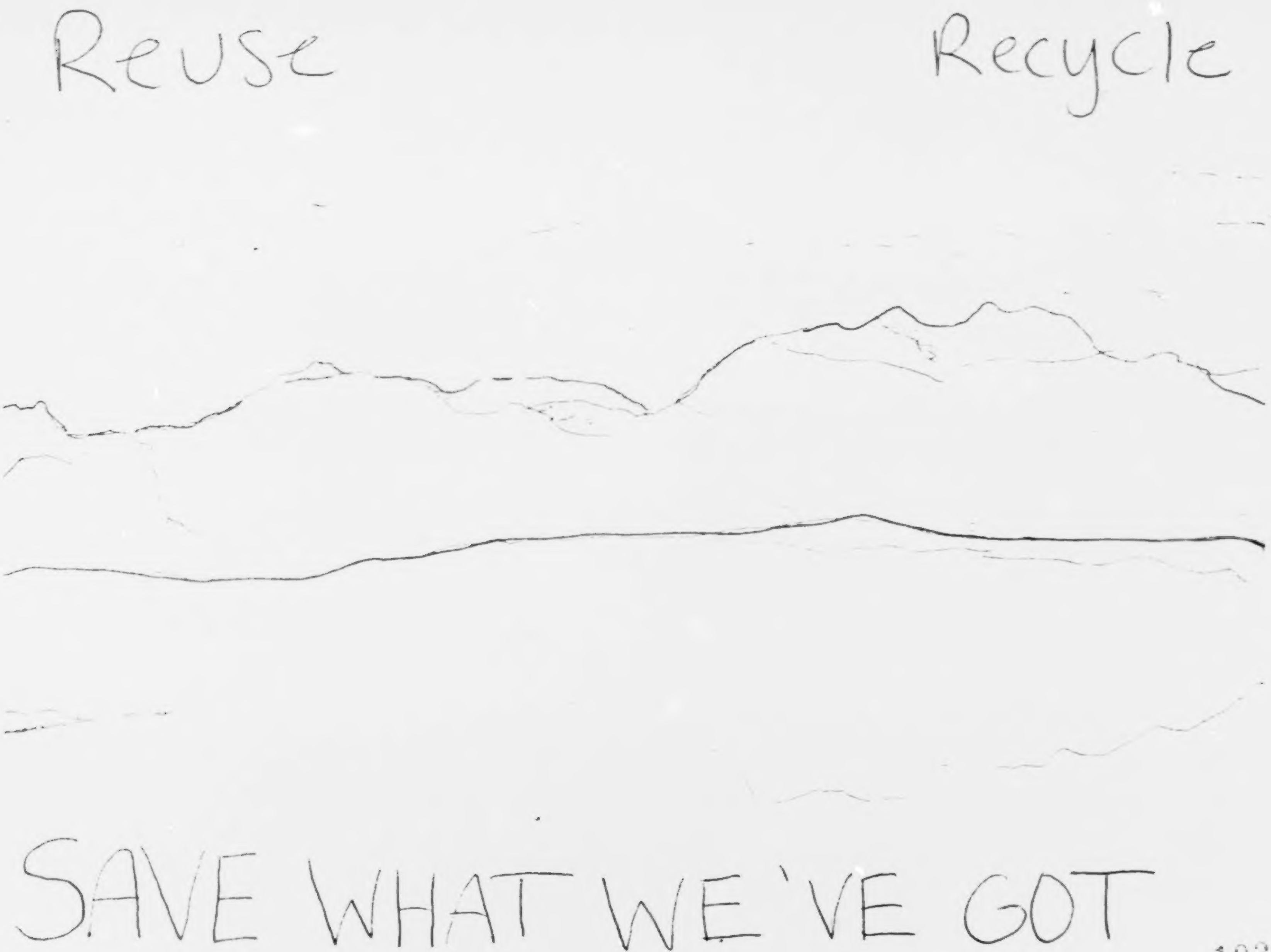
- Compare the effectiveness of a live performance versus a video performance in promoting a message.

Discussion Ideas:

How can we apply lessons we learned from our Elders about how they lived to the way we live now? Are there ways we can use modern technology to live in closer harmony with the environment?

Resources:

1. National Citizens Committee for Broadcasting. The Whys and Hows of Public Service Announcements. National Citizens Committee for Broadcasting, Suite 415, 1345 Connecticut Avenue, N.W., Washington, D.C. 20036.
2. Waste Reduction and Recycling Recognition Awards Program for Schools. Application form and information. Sponsored by Alaska Department of Environmental Conservation and Alaska Department of Education. (included in the Supplemental Materials.)
3. "Waste Minimization Policy for a Local School District in Light of Indian Traditionalism," by James Spencer III, Poplar, Montana. From: technical proceedings, 1990 Pacific Northwest International Section of Air and Waste Management Association annual convention, November 14-16, 1990, Portland, Oregon.


Reuse
Recycle
SAVE WHAT WE'VE GOT

-ALBERT KOOKESH, 8TH GRADE, ANGOON AK

Endnotes

1 United States Fish and Wildlife Service. "Endangered Species" (brochure).

2 Assumes about six pounds per person per day.

3 National Solid Waste Management Association. Recycling: Treasure in our Trash. 1988.

4 Dr. Norman Meyers, ed. GAIA: An Atlas of Planet Management. Anchor Press/Doubleday, 1984.

5 Rick Rogers. Municipal Solid Waste: A resource Assessment for Energy Recovery in Alaska. Alaska Energy Authority, 1991.

6 URS Engineers and Trans Energy Systems, Inc. Municipality of Anchorage Solid Waste Management Plan, Volume II. 1984.

7 City of Petersburg. Municipal Solid Waste Treatment and Disposal Feasability Report. 1987-88.

8 Weston, Inc. and Tryck, Nyman and Hayes. FeasablilityInvestigation: Septage/Solid Waste Co-disposal for the Kenai Peninsula Borough. 1984.

9 Pacific Associates. A Report to the Alaska Department of Environmental Conservation on the Effects of MARPOL Annex V on the Ports of Kodiak and Unalaska. 1988.

10 Randolph Bayliss and C. Deming Cowles. On the Impact of MARPOL Annex V upon Solid Waste Disposal Facilities of Coastal Alaskan Communities, for the Southwest Alaska Municipal Conference. 1989.

11 Environmental Task Force. Resources. Vol. 6, No. 3, 1986.

12 Cynthia Pollack-Shea. "Realizing Recycling's Potential" from State of the World 1987. W.W. Norton and Co: New York, N.Y., 1987.

13 Pollack-Shea.

14 Anchorage Recycling Center. "The Hows and Whys of Recycling," (brochure).

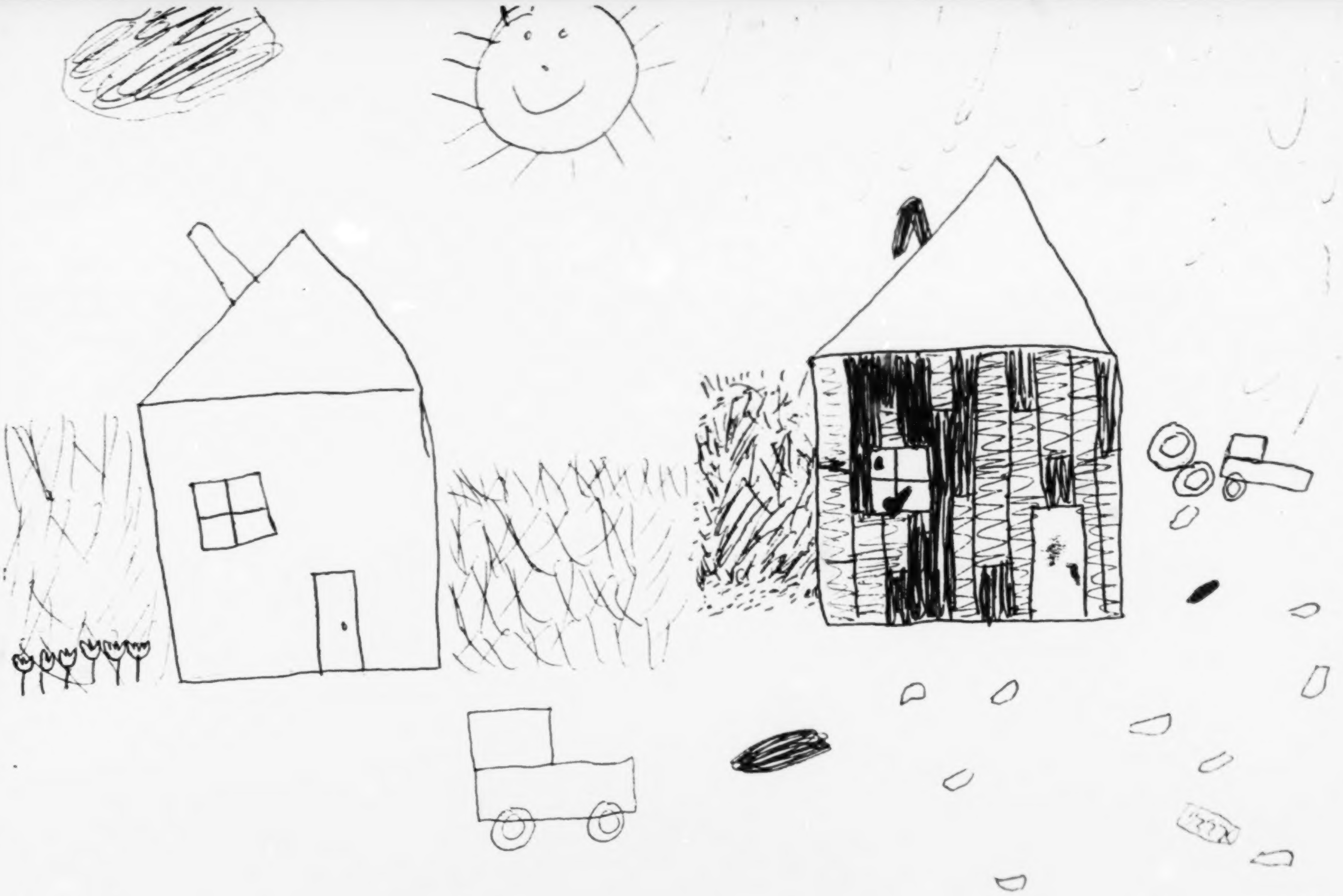
15 Anchorage Recycling Center.

16 Rogers.

17 Anchorage Recycling Center.

18 Anchorage Recycling Center.

19 S.J. Bennett and Co. The Green Pages. 1990.



Which would You Rather Live In?

-LILLIAN HUNTER, 8TH GRADE, ANGOON AK

Glossary

Biodegradable — Capable of being broken down by micro-organisms into simpler compounds.

Carcinogen — A substance that can cause cancer if it comes in contact with the body (through ingestion, inhalation or skin absortion).

Carnivore — An animal that eats only other animals.

Caution — On a warning label, this signifies that, if ingested, a lethal dose is an ounce to a pint. (See **danger** and **warning**.)

Combustible — Capable of easily catching fire, though in legal terms combustible substances are slightly less of a fire hazard than **flammable** substances, as measured by the flash point.

Composting — A natural microbial process in which **organic** (plant and animal) waste is decayed or degraded to nutrient-rich soil which can be used as fertilizer.

Consumers — (1) In a **food chain**, those organisms that eat other plants or animals which are at lower **trophic levels** on the food chain; (2) people who buy goods or services for their own needs and not for resale or production of other goods for resale.

Consumption — The process of buying goods (or services) for use and not for resale nor for production of other goods for resale.

Corrosive — Capable of causing deterioration of another material; a corrosive chemical might dissolve or rust metal or burn skin (examples: acids, lye, drain cleaner, battery fluid).

Danger — On a warning label, this signifies that, if ingested, a lethal dose is from a taste to a teaspoon (See **warning** and **caution**).

Decompose — To decay, rot, come apart, change form and/or break-down into simpler, more stable components.

Decomposers — Organisms that decay, rot, change or break down material into simpler components.

Diverse — When used in reference to an **ecosystem**, **diverse** means that the system contains a wide variety of **species**.

Dump — Open, unsanitary or unsafe waste disposal site that does not meet current environmental regulations.

Ecosystem — A system made up of a community of living things, including plants, animals, microbes, and humans, and the physical and chemical environment with which they interact.

Encroachment — Intrusion or trespass beyond previous boundaries or limits.

Endangered species — A **species** that is in danger of **extinction** throughout all or a significant portion of its range (as defined by the Endangered Species Act).

Explosive — Capable of being ignited by a spark or a sharp impact.

Extinction — Total eradication of a **species**.

Flammable — Capable of easily catching on fire. Examples: gasoline; paint thinner; lacquer; solvents (See **combustible**).

Food chain — A portion of the **food web**, most commonly a simple sequence of prey species and the predators that consume them.

Food web — The complete set of **food chains** between species in a community or **ecosystem**; also, a diagram indicating which **species** consume which other species.

Hazardous waste — Any substance that can cause health or environmental damage because it is poisonous, flammable, explosive, radioactive, corrosive, reactive, infectious or dangerous to organisms for any other reason (note that the legal definition is less inclusive).

Herbivore — An animal that eats only plants.

Incineration — Using controlled flame combustion, in a specially designed device, to reduce the volume of **solid waste**.

Inorganic — Composed of matter that is not animal or plant.

Landfill — A site devoted to storing **solid waste** either on or in the land. The term is usually used to refer to a legal and sanitary site (See **dump**).

Manufacture — To make or produce goods by hand or machinery.

Migration — The act of a group of people or animals moving together from one place to another, often over long distances.

Mulch — **Organic** materials such as leaves and moss that are spread on the soil around garden plants to slow down evaporation of moisture and freezing of roots.

Natural resources — Materials or substances that occur in nature and that have value.

Nonrenewable resources — Natural materials that are finite, exhaustible and not replenishable.

Omnivore — An animal that eats both plants and animals.

Organic — (1) Of or derived from living organisms; (2) grown with fertilizers that consist only of plant or natural matter, with no chemical additives.

Pollutants — Substances that cause **pollution**, contamination.

Pollution — Contamination of the air, land or water by harmful substances.

Predator — An animal or human that kills and eats other organisms, (usually meaning the consumption of animals, but could also mean the consumption of plants).

Producers — Organisms at the first **trophic level** of the **food chain** in an **ecosystem**, such as green plants, which convert energy into new tissue by growth, reproduction and storage of products such as fat and carbohydrates.

Reactive — Unstable or capable of creating a rapid or violent chemical reaction (e.g., explosion, combustion) when combined with other materials. (Examples of **reactive** chemicals: bleach; oxidizers; chlorine)

Recycle — To collect, sort, process and reuse materials, either in the same form or as different products.

Renewable resources - **Natural resources** that can be replenished by natural ecological cycles or sound environmental management.

Retail — Goods sold to the **consumer**, usually purchased from a wholesaler.

Solid waste — Trash, garbage, litter or any substance, hazardous or nonhazardous, liquid or solid, that is no longer being put to use.

Source reduction — Any activity that reduces waste before it can be generated, at the source.

Species — A type of organism that interbreeds only with other members of that type and not with individuals outside the group.

Subsidence — The settling of the surface of the ground, sinking or lowering.

Subsistence peoples — People whose livelihood comes from the resources of their native land and waters.

Threatened species — A species that is likely to become **endangered** within the foreseeable future.

Toxic — Poisonous, dangerous, harmful or injury-causing.

Toxicity — The capability of a substance to cause harm, either after a single exposure or dose (acute toxicity), or after long-term exposure to low doses (chronic toxicity).

Trophic level — the position of a species in a **food chain**, indicating which **species** it consumes and which species consume it.

Warning — On a warning label, signifies that if ingested, a lethal dose of is from a teaspoon to a tablespoon (See **danger** and **caution**).

Waste reduction — Lessening the amount of waste produced by **source reduction** and/or **recycling**. Also referred to as "pollution prevention" or "waste minimization."

Wholesale — Goods sold in large quantities, usually at lowerprices than **retail**. Usually goods that are sold to retailers.

-LEONARD NIKI ACKER, 5TH GRADE, ALLAKAKET, AK

Resources

In Alaska:

Alaska Center for the Environment
Holly Kane
519 West 8th Ave #201
Anchorage, AK 99501
274-3621

Ms. Kane runs the Green Star program, which provides support and recognition to schools involved in solid waste reduction efforts.

Alaska Center for Rural Health
Daniel A Johnson, Director
PO Box 81710
Fairbanks, AK 99708-1710
474-6020

Alaska Department of Education
801 W. Tenth
Juneau, AK
Mike Travis, rural education
465-8691

Alaska Department of Environmental Conservation
410 Willoughby Ave
Juneau, AK 99807
465-5000

Heather Stockard, Head of DEC's Solid and Hazardous Waste Management division, suggests that people get in touch with their regional DEC office to make arrangements for a visit from a solid waste expert. The Department also can provide curricula on drinking water, hazardous waste management and recycling.

Alaska Health Project
Thomas Brunddnicki, Industrial Hygienist
1818 W. Northern Lights Boulevard, Suite 103
Anchorage, AK 99517
276-2864

The Alaska Health Project publishes the Trash Management Guide (by Margaret Drumm, 1992). This test is designed to aid small governments in establishing waste management plans, this document would be appropriate for older students and could be used as a guide for setting up village solid waste plans.

Alaska Native Health Board
1345 Rudakof Circle, Suite 206
Anchorage, AK 99508
337-0028
Cindy Thomas, Environmental Engineer

The Alaska Native Health Board publishes Good Earth: A Community Program. This document is intended to "help Alaska Natives deal with hazardous materials and protect the health of the people, the animals and the land." The text outlines the basics of hazardous waste and how they pertain to Village life and outlines a plan of action for involving the community in dealing with hazardous wastes.

Regional Health Corporations can provide a range of expertise and materials on environmental and other issues. Some regional corporations already have their own environmental education programs. Work with the corporation nearest your village.

Aleutian/Pribilof Islands Assoc., Inc
401 E. Fireweed Lane, Suite 201
Anchorage, AK 99503
276-2700
fax: 276-4894

Bristol Bay Area Health Corp.
PO Box 130
Dillingham, AK 99576
(800) 478-5201, 842-5201
fax: 842-9409

Chugachmiut
4201 Tudor Centre, Suite 201
Anchorage, AK 99508
562-4155
fax: 563-2891

Copper River Native Association
PO Box H
Copper Center, AK 99573
822-5241
fax: 822-5247

Kodiak Area Native Association
402 Center Avenue
Kodiak, AK 99615
486-5725
fax: 486-2763

Manilaq Association
PO Box 256
Kotzebue, AK 99752
442-3311
fax: 442-2381

Metlakatla Indian Community
Annette Island Service Unit
PO Box 439
Metalakatla, AK 99926
886-6601
fax: 886-6976

North Slope Borough Health Dept.
PO Box 69
Barrow, AK 99723
852-0260
fax: 852-0268

Norton Sound Health Corp.
PO Box 966
Nome, AK 99762
443-3311
fax: 443-3724

Southcentral Foundation
670 W. Fireweed Lane, Suite 123
Anchorage, AK 99503
276-3343
fax: 265-5925

Southeast Alaska Regional Health Consortium
3245 Hospital Drive
Juneau, AK 99801
463-4000
fax: 463-4075

Tanana Chiefs Conference, Inc.
Office of Environmental Health
Dan Strausbaugh, Environmental Health Specialist x3209
122 First Avenue
Fairbanks, AK 99701
452-8251
fax: 459-3850

Yukon-Kuskokwim Health Corp.
PO Box 528
Bethel, AK 99559
543-3321
fax: 543-5277

Alaska Recycling Center
Lynn Fitch
6161 Rosewood St
Anchorage, AK 99518
562-2267

The Alaska Recycling Center has many resources to offer schools involved in waste reduction efforts. The Center offers a pamphlet on recycling in Alaska ("The Fourth R -- Recycling in Alaska") and also has other resource materials, including curricula and videos.

U.S. Environmental Protection Agency
Anchorage Operations Office
222 West 7th Ave., #19, Room 537
Anchorage, AK 99513-7588
271-5083

The Anchorage EPA office can provide speakers on environmental issues.

Cathy Rezabeck, Education Coordinator
U.S. Fish and Wildlife Service
1011 E. Tudor Rd.
Anchorage, AK 99503
786-3651

Ms. Rezabeck can help find materials on wildlife issues and can also help set up a visit to your school from a Fish and Wildlife officer. Among other publications, the Fish and Wildlife Service has The Adventure of Simon and Mary Nunantuk: The Story of Wildlife Management on the Yukon-Kuskokwim Delta, an excellent primer illustrating basic principles of wildlife management and their relation to subsistence hunting in an extended comic book format.

Ms. Rezabeck also suggested that teachers get in touch with the nearest regional Fish and Wildlife office or National Wildlife Refuge (there are 16 around the state). The National Wildlife Refuges maintain educator assistance libraries -- these could prove to be a great source of information.

Outside Alaska:

American Chemical Society
Department of Government Relations and Science Policy
1155 16th Street, N.W.
Washington, DC 20036
(202) 872-8725

The American Chemical Society, an industry group, publishes free pamphlets on environmental issues related to chemical use. Each 10 to 20 page pamphlet addresses a different topic. Titles include: "Chemical Risk: Personal Decisions," "Chemical Risk: A Primer," "Hazardous Waste Management," "Ground Water," "Acid Rain," "Global Climate Change" and "Biotechnology." These pamhlets would be good resources for teachers or sophisticated students looking for more information on these topics.

American Indian Science and Engineering Society
John Hoover, Director of Research
1630 30th St.
Boulder, CO
(303) 492-8658

The American Indian Science and Engineering Society (AISES) is a non-profit organization which seeks to increase the number of American Indian scientists and engineers in the nation and to develop technologically informed leaders in the Indian community. AISES provides teacher training and student college scholarships; students interested in pursuing a college education in environmental or other sciences should be aware of this resource.

Bullfrog Films
1-800-543-3764

An incredible resource: free catalog lists dozens of videos applicable to this curriculum and related topics. A brief sampling includes:
- "Haida Gwaii: The Queen Charlotte Islands in the Web of Life," a document of the Haida people's struggle to adapt to abuses of resources (fish and timber) in their homeland
- "Water," which examines a fresh water ecosystem
- "Toxic Waste," a look at the useful functions, methods of disposal and potentially devastating impacts of toxic materials
- "Waste," dealing with generation, disposal and reuse of wastes at scales from household to global

Concern, Inc.
1794 Columbia Road, NW
Washington, DC 20009
(202) 328-8160

Concern publishes guides on how to get involved in advocating for policies and programs on environmental issues. Topics covered by the guides include global warming, household waste, waste and drinking water.

National Consortium for Environmental Education and Training
University of Michigan School of Natural Resources and Environment
PO Box 1141
Ann Arbor, MI 48106-1141
313-998-6727

The Consortium publishes "Getting Started: A Guide to Bringing Environmental Education into Your Classroom," which provides information on how to find funding, training and other resources necessary to implement a successful environmental education program. The guide also includes anecdotes from teachers who have struggled to establish environmental education programs. The guide is $9.95 plus $3.00 shipping and handling.

National Wildlife Foundation
1400 16th St., NW
Washington, DC 20036-2266
800-432-6564

The National Wildlife Foundation publishes NatureScope, an award-winning environmental education activity series for grades K-8. Topics covered include endangered species, pollution, wetlands and geology.

City of Seattle
Department of Housing and Human Services
Office for Education
Alaska Building, 618 2nd Ave
Seattle, WA 98104-2232

As of the summer of 1994, the City of Seattle is developing an Environmental Education Resource Guide and Directory to contain the most up-to-date information on K-12 environmental education programs and services available. While this directory will be focused on the Seattle/Puget Sound region, it will surely reference sources that could be useful to teachers in Alaska.

U.S. Environmental Protection Agency, Region 10
Public Information Center
1200 6th Ave., SO 143
Seattle, WA 98101
800-424-4EPA

The EPA publishes The Consumer's Handbook for Reducing Solid Waste (document #EPA530-K-92-003, August 1992). This colorful, well-illustrated booklet outlines simple ways to reduce generation of solid waste at home. Portions of this document could be used for grades ranging from K-12. The EPA also can provide many other sources of information on solid waste and other environmental issues, including environmental education materials (activities, curricula, videos) for grades K-12.

The Video Project
5332 College Avenue Suite 1E
Oakland, CA 94618
1-800-4-PLANET

A selection of videos ranging from the general ("A Kid's Eye View of Ecology," "Cleaning Up Toxics at Home") to pieces of regional interest ("When the Spill Hit Homer").

The Windstar Foundation
2317 Snowmass Creek Road
Snowmass, CO 81654
(303) 927-4777

Windstar publishes the EarthPulse Handbooks, a series of short (about 100 pages), easy-to-understand books on energy, recycling, everyday chemicals, food and water. Each book offers background information and tips on simple things we can do to create a healthier environment. This series is an excellent source of facts and figures that help illustrate the "big picture" of national and global resource use and how local uses fit into this scenario. The handbooks are $3.95 each.

Worldwatch Institute. State of the World. N.Y., N.Y.: W. W. Norton and Company, annually from 1984.

This collection of essays on the state of the earth has come out annually since 1984. Teachers and some high school students will enjoy the clean, clear writing on major global environmental problems -- most case studies address a global problem and look at local examples. Essays in recent editions include: "Holding Back the Sea" (on rising ocean levels), "The Illusion of Progress," "Reducing Waste, Saving Materials" and "Assessing the Military's War on the Environment."

Washington State Department of Ecology
4350 150th Avenue NE
Redmond, WA 98052
(206) 867-7043

The Washington State Department of Ecology publishes A-Way With Waste: A Waste Management Curriculum For Schools. This is a comprehensive curriculum for grades K-12, over 500 pages in a well-organized loose-leaf format. The curriculum outlines many acitvities and would be a great supplement to Changing Waste in Changing Times. A-Way With Waste includes an extensive and very useful bibliography.